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journal of dental medicine

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"To promote the study and dissemination of knowledge of the cause, prevention and control of diseases of the teeth, their supporting structures and adnexa and related subjects; and to foster and promote a better scientific understanding between the fields of dentistry and medicine."

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5. Data presented in charts and tables should be discussed but not repeated in the text.

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RETIRING PRESIDENT'S REPORT

Marcel B. Archambault, B.A., D.D.S.

As the year draws to a close, a feeling of nostalgia still prevails among the members of the American Academy of Dental Medicine. 1958 will long be remembered by all of us because of the loss of one of our most distinguished and beloved members: Dr. Samuel Charles Miller.

I believe it was the will of God which inspired Dr. Sidney Sorrin and his fellow associates at New York University to arrange a testimonial dinner to honor Dr. Miller just a few weeks before he passed away. On that occasion, hundreds of telegrams and messages came from all parts of the world as a tribute to him and as proof of the esteem and admiration everyone held for him.

Once more we have achieved another year of progress in the Academy. It was even greater than your National President had anticipated at the beginning of his term of office. This success, of course, is due to the concentrated efforts displayed by your National Officers, your Committee Chairmen and your Section Officers.

This year, the American Board of Oral Medicine did not meet in Montreal as previously planned. You have heard a very encouraging report from the Secretary of the Board, Dean Lester W. Burket.

Sections and their problems seem to draw the attention of every President. I am happy to report that all our sections have been active. They have responded with eagerness and promptitude to all my requests. Unfortunately, too little time and interest have been given to our Sections by the National Body. In the future, I hope, Section Delegates will meet twice a year with a responsible National Officer to discuss their problems, to present their programs and to study the possibility of exchanging ideas, speakers, films and papers.

The chairman of the Committee on Sections, Dr. Sam Turkenkopf, has been on the alert. His efforts have been rewarded with the formation of a new Section in North Carolina and the prospect of another Section in Missouri.

During the past year, Dr. Abraham Goldstein, chairman of the Membership Committee, has made out two new lists of candidates. This brings our total membership to a new high of over 900 members.

We are proud of Dr. Irving Yudkoff. His achievements, as Editor of our Journal, have been unsurpassed. He has managed to run the Journal on a small budget. He succeeded, nontheless, in producing one of the finest Journals in Dentistry. Our circulation has increased from 1200 to 2000 copies in the last five years. And, because of its size and scope, the Journal is now recognized as a prominent international publication.

The Mid-Winter Meeting was a splendid and successful event, thanks to Dr. Sheldon Ross and his entire Committee. The Annual Convention in Montreal was run

by a joint chairmanship: Louis Rosen and Albert Laferrière under the direction of our National Convention Chairman, Dr. George Clarke. Datas have been gathered and this information, we hope, will serve as a pattern to be used in our future conventions.

Our finances are in good hands with Dr. William Greenhut back at the helm. Our National Secretary, Dr. George Witkin, handled his share of responsibilities in a manner that deserves our admiration.

One of the interesting features, when one occupies the presidential seat, is of course the privilege and honor of being received and entertained by the Sections. Much to my regret, Philadelphia, New York and Montreal were the only Sections I was permitted to visit. I had to decline an invitation by the New Jersey Group because of ill health. At these meetings the atmosphere was warm and the programs outstanding.

And now, a word of thanks to all of you whom I have not mentioned in my report for whatever contribution, great or small, you have made to the American Academy of Dental Medicine. I wish to express my gratitude to every member of the Montreal Section for the help and encouragement they have given to a fellow Canadian.

My term is up and before I retire to the gallery of oblivion let me present to you my successor, Dr. Don C. Lyons. Don, in handing this gavel to you, may I say that you can depend on all of us at all times with due respect and affection from every loyal member of this Academy. Thank you and God Bless you all.

TO DR. SAMUEL CHARLES MILLER

THE ROAD TO IMMORTALITY

During our brief life as mortals, we are striving fairly, squarely,
In our daily tasks we labor, with a central thought in mind,
Though we favor social gatherings to supplement our pleasures,
Though we advocate athletics in its various forms and kind.

Yet a higher thought arises which requires deep cogitation
And must firmly be imbedded in our minds throughout our lives.
How am I to aid my fellow, is the question that concerns us,
Wherein will mere existence leave an imprint upon time.

We begin to reconsider that our life is like a candle,
That it must be terminated when its usefulness is o'er,
Though the light it now is shedding must by Nature be extinguished,
Yet the influence and impulse, emanated, will remain.

If we place this thought before us in our daily undertakings
We can finally accomplish good results where others fail;
If in all associations, we can love and cherish friendship,
Then by aiding each one singly, we will be aiding all.

Only then our life is fruitful and has earned due commendation;
Only then we have returned to Nature, thanks for all the gifts she gave;
We return to earth contented, one thought in us remaining,
That our life is now enriched, by our acts, our deeds, our all.

SIDNEY SORRIN

THE RELATION OF SALIVARY GLANDS TO CERTAIN ENDOCRINE GLANDS*

J. F. VOLKER, A.B., M.S., D.D.S., PH.D.**

The ability of saliva to digest starch, inhibit microbial growth, mechanically clean the oral tissues, and accelerate the coagulation of blood has been rather intensively studied by a considerable number of investigators and for the most part is well known to dental practitioners. The literature up through the 1940's has been very adequately summarized in a review by Bibby.[1] In contrast, investigations that are suggestive of the complex relationship between the salivary glands and a number of the endocrine glands have frequently not been reported in the dental clinical literature. Since these researches are increasing at a rather surprising rate, it seems pertinent to attempt to review and interpret the accumulated findings.

Our laboratory became interested in the problem in 1941, primarily because of the increasing use of desalivated rodents for experimental caries studies. Although we recognized that such procedures hasten the onset of the carious process and increase its severity, we felt it desirable to establish whether or not the alteration had an adverse effect on general development. To test this possibility we set up an experiment using three groups of comparable rats.[2] One served as a control and remained unoperated. A second group was subject to a sham operation wherein the incision was made and the salivary glands laid bare but closure was made without tissue removal. The third group had the major salivary glands removed completely. The experimental procedures were performed at weaning and immediately thereafter the animals were placed on a reconstituted milk diet fortified with adequate amounts of copper, iron, and manganese. This diet was chosen because it had been shown to be adequate for normal growth and minimized the effect of desalivation on digestion.

No differences were observed in the physical appearance of the normal and sham-operated groups. The desalivated group, although apparently enjoying good health, showed a reduction in growth and a pronounced rusting of the fur. Within the group the changes were more pronounced in the female than the male. As would be anticipated, our first thought was to check the food consumption of the three groups. Fortunately this had been recorded and was found to be comparable. Since this ruled out differences in growth rate on the basis of food ingestion, our next thought was to seek explanation of the phenomenon on the basis of possible differences in overall food utilization, i.e., basal metabolic rate. Accordingly, the basal metabolic rates of the animals were determined under carefully controlled conditions. No changes were observed.

It was apparent to us that the explanation for our findings probably could be found in a complex interrelationship between the salivary glands and certain endocrine glands. This led us to a survey of the scientific literature. Since desalivation had a more pronounced effect on the females, our initial interest was in a possible relationship between the salivary glands and the sex glands. This approach brought us to the researches of Lacassagne and his French colleagues.[3] These studies began as early as 1940 and are still in progress. Initially they observed that the submaxillary glands in the male and female mice showed a sex-linked histological difference. Upon the administration of testosterone the submaxillary gland of the female mouse changed to the male type and the reverse resulted when the male mouse was given folliculin. Further literature review un-

* Presented before the 14th Annual Meeting of the American Institute of Dental Medicine, Palm Springs, California, October 13-17, 1957.

** Dean, School of Dentistry, University of Alabama, Birmingham, Alabama.

covered the work of the Japanese investigator Higashijo.[4] He reported that the removal of the submaxillary glands and the ligation of the parotid glands in young rats causes hypertrophy of the uterus in the female and atrophy of the testes in the male. Collectively, the early researches of these two groups supported the possible interrelationship of the salivary glands and the sex glands.

This view was further documented by the subsequent researches of Shafer and Muhler.[5] They have gonadectomized both male and female rats. Compared with control animals, both the experimental males and females showed very obvious changes in the submaxillary glands. This was chiefly apparent in the decrease in size and number of secretory tubules. When these investgations are added to those of Lacassagne and Higashijo a two-way relationship seems operating since removal of the salivary glands causes alteration in the gonads while removal of the gonads brings about changes in the structure of the salivary glands. Still another observation indicative of a salivary gland-gonad relationship is the report of Kochakian[6] that the subcutaneous implantation of androgen pellets in castrated mice doubles the combined weights of the sublingual and submaxillary glands within twenty days.

The experimental animal studies indicating a relationship between the salivary glands and the gonads finds support in numerous clinical observations. The effect of acute epidemic parotitis on the testicles, ovaries, and breasts has long been known. Furthermore, it is generally accepted that these changes tend to occur usually in people with well developed sexual functions and only rarely in children and old people. Also, abnormal enlargement and hyperfunction of the parotid has been reported rather frequently in men and women at their climacteric and menopause. Similarly, there are many well documented cases of parotid hypertrophy and pregnancy. One of these is unique in that it reports a patient that had painless enlargement of the parotid during six successive pregnancies with the glands returning to normal size between times.[7] Interestingly enough, the enlargement was so rapid and so prompt that it was the first diagnostic sign of pregnancy. Finally, there has been reported a premenstrual salivary syndrome characterized by swelling of the salivary glands four or five days before the onset of menstruation. This was preventable by administering corpus luteum hormone ten days before the onset of menstruation.[8]

As a sequal to the animal experiment showing altered salivary gland morphology following gonadectomy Shafer and Muhler investigated the effect of such a procedure on the incidence of experimental caries.[9] Whereas orchiectomized rats showed a reduction in caries experience the findings with ovariectomized rats were inconclusive. When castrated male and female rats were given diethyl stilbestrol and estradiol, there was an increase in dental caries incidence in both males and females.

An increasing number of studies has been suggestive of a relationship between the salivary glands and the thyroid. Of fundamental importance is the continuing work of Barker at our institution.[10] He has been primarily interested in the extrathyroidal effects of thyroxin and thyroxin-like substances on the oxygen consumption of various body tissues. His general approach is to thyroidectomize animals and after sacrifice observe the metabolic rate of the tissues. He has observed that under these conditions the oxygen consumption of the salivary gland is reduced by more than 20 per cent. In this respect it behaves like the liver, kidney, and pancreas. When thyroxin is injected into these thyroidectomized animals, the oxygen consumption of salivary glands similarly prepared increases by more than 33 per cent. The liver, kidney, and pancreas respond in a similar fashion. For more comparative purposes it should be noted that the oxygen consumption of such tissues as the spleen, brain, ovary, uterus, prostate, and seminal vesicle is affected only minimally by thyroidectomy and subsequent thyroxin injection. Barker has concluded that the energy metabolism of the salivary gland is under the control of the thyroid gland.

Such a conclusion is consistent with the observation of Leblond and Grad[11] that following

thyroidectomy there is a decrease in size of the submaxillary gland and atrophy of the serous tubules in both the male and female. Thyroxin injection is capable of repairing all of the changes in both sexes. Muhler and Shafer[12] have investigated the thyroid-salivary gland relationship with regard to experimental caries susceptibility. They have reported that the addition of desiccated thyroid to a caries-producing diet reduces rat dental caries to approximately the same extent as fluoride ingestion. They have also noted that when thiouracil, a thyroid gland depressant, is fed in the diet that there is a significant increase in dental caries. A triangular relationship involving the thyroid gland, gonads, and salivary glands seems probable on the basis of researches by Grad and Leblond.[13] They have shown that the administration of thyroxin and testosterone to gonadectomized, thyroidectomized rats results in the restoration of normal size, granule content, and cell number of the serous tubules of rats' submaxillary glands. This view is supported by Muhler and Shafer[14] who have presented data indicating that testosterone increases the anticariogenic effect of desiccated thyroid even though testosterone itself is without effect on the incidence of experimental dental caries.

Within the last several years Fawcett and Kirkwood[15a, 15b] have suggested a new hypothesis of thyroid-salivary gland interrelationship and have presented experimental evidence to support their concept. They have reported that next to the thyroid gland the submaxillary and parotid glands contain the greatest amount of the enzyme tyrosine iodinase. According to them this enzyme functions in the thyroid to synthesize organically bound iodine compounds. On the other hand, the enzyme functions in the submaxillary and parotid glands to degrade organic iodine compounds. This suggest that the salivary glands function as reverse thyroids. Unfortunately, other laboratories have not confirmed certain of their observations.

Since radioiodine 131 has become increasingly available for human use, some rather interesting observations have been made that may be relevent to a thyroid-salivary gland relationship. Schneyer has studied the salivary amylase activity of human subjects following the administrations of I 131 for the treatment of thyroid carcinoma and hyperthyroidism.[16] He has reported that for as long as four days following its administration salivary amylase activity remains unchanged. Following this period the activity drops markedly and then returns slowly to the preadministration level. Furthermore, Honour and his collaborators[17] have observed that the intravenous injection of I 131 into human subjects produces a saliva-plasma-iodine ratio of 40 within ten minutes. This is interpreted to indicate that the salivary glands possess an iodine concentrating mechanism which may be comparable to the thyroid. Collectively, these researches support the concept of a complex salivary gland-thyroid relationship that participates in iodine metabolism.

More recently it has been reported that desalivation affects the adrenal glands of animals.[18a, 18b] This opinion is based on the finding in a histochemical study of the adrenal glands of rats of various ages that had been desalivated, sham operated, or had normally functioning salivary glands. Increased lipoid activity in the cortex of the desalivated animals was noted. Similarly the Schiff plasmal reaction was most intense in the fasciculata of the desalivated animals. The control and sham operated animals failed to show any of these alterations. As yet it is not possible to evaluate the significance of these findings.

It appears, however, that the salivary secretions of sodium, potassium and chloride in humans is under the partial control of the adrenal glands since the administration of desoxycorticosterone or ACTH produces a fall in the salivary sodium and chloride level and a rise in the potassium level.[19, 20] Furthermore there is evidence that the sodium/potassium ratio of the saliva increases in adrenocortical hypofunction (Addison's disease) and decreases when corrective therapy is instituted.

These findings bring to mind that the adrenal glands have been associated with stress reactions. This in turn recalls the interesting enzymatic changes in parotid saliva as related to

psychopathology reported by Giddon.[21] Initially he surveyed a normal population and found that the parotid saliva of all persons tested contained measurable choline esterase activity. Since this is possibly related to autonomic activity, the study was extended to mental patients where it was observed that some of the individuals had no measurable choline esterase activity. In an attempt to evaluate the hypothesis that salivary choline esterase activity was a reflection of a psychological state, a study was designed wherein choline esterase was measured in normal individuals under non-stress states and in induced states of stress. The stress periods were induced by blood sampling, hyperventilation and cold pressor. It was found that both the anticipation of the stress as well as the stress itself produced marked depression of the salivary choline esterase levels even though the mean blood pressure value did not change under these circumstances. These observations are interesting in view of an earlier report that an experimentally induced alarm reaction produces characteristic changes in the salivary glands of animals.[22] Particularly evident is the loss of the basophile matter of the secreting epithelial cells.

From the researches enumerated above the following tentative conclusions can be drawn:

(1) That a relationship exists between the salivary glands and certain endocrine glands, particularly the gonads and the thyroid and very possibly the adrenals.

(2) In rodents a dimorphism of the salivary glands has been noted that distinguishes males from females. These characteristics can be reversed by administration of appropriate sex hormones.

(3) This is a two-way relationship since under certain conditions the removal of the gonads brings about structural changes in the salivary glands.

(4) A considerable number of observations have been made in human subjects that support a salivary gland-gonad relationship.

(5) The salivary glands are under the intimate control of the thyroid. Thyroidectomy causes structural alterations in the salivary gland and reduces salivary flow. Comparable changes can be noted with thiouracil feeding. The opposite is observed when thyroxin is administered. The changes observed in the salivary flow seem to be correlated with differences in caries susceptibility.

(6) There is increasing evidence to support a three-way relationship involving the salivary glands, gonads, and thyroid.

(7) A considerable data has been accumulated indicating that both the salivary glands and the thyroid participate in iodine metabolism.

(8) Desalivation causes histologic changes in adrenal glands and the alarm reaction has been reported to involve histologic changes in the salivary glands. This suggests an interrelationship between the adrenals and salivary glands, possibly through the stress phenomenon.

(9) Clinical evidence has been accumulated that psychopathic patients and normal patients under stress have a reduction in the quantity of choline esterase in their saliva.

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LE RELATION DEL GLANDULAS SALIVARI A CERTE GLANDULAS ENDOCRIN

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SUMMARIO IN INTERLINGUA

Ab le supra-enumerate recercas, le sequente tentative conclusiones pote esser derivate.

1. Il existe un relation inter le glandulas salivari e certe glandulas endocrin, specialmente le gonades e le thyroide e possibilissimemente le adrenales.

2. In rodentes, un dimorphismo del glandulas salivari ha essite notate le qual distingue le masculos ab le femininas. Iste characteristicas pote esser revertite per le administration del appropriate hormones sexual.

3. Il se tracta de un relation mutual, proque sub certe conditiones le excision del gonades effectua alterationes structural in le glandulas salivari.

4. Ha essite facite in humanos un considerabile numero de observationes que supporta le these del relation inter glandulas salivari e gonades.

5. Le glandulas salivari se trova sub le intime control del thyroide. Thyroidectomia causa alterationes structural in le glandulas salivari e reduce le fluxo salivari. Alterationes comparabile se nota in alimentation a thiouracil. Le contrario es observate quando thyroxina es administrate. Le alterationes observate in le fluxo salivari pare esser correlationate con differentias del susceptibilitate de disveloppar carie.

6. Se accumula le indicios de un relation triadic in que le glandulas salivari, le gonades, e le thyroide es interessate.

7. Un corpore considerabile de datos indica que le glandulas salivari e le thyroide participa in le metabolismo de iodo.

8. Dissalivation causa alterationes histologic in le glandulas adrenal, e reportos existe de alterationes histologic in le glandulas salivari como effecto del reaction de alarma. Isto suggere le existentia de un relation inter le adrenales e le glandulas salivari, possibilemente via le phenomeno del stress.

9. Datos clinic se ha accumulate que pare indicar que patientes psychopathic e individuos normal in stato de stress ha reducite nivellos de esterase cholinic in lor saliva.

THE ETIOLOGIC ROLE OF TOBACCO, AVITAMINOSES AND OTHER FACTORS IN ORAL CANCER†

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Clinical studies of leukoplakia and cancer of the mouth suggest that their pathogenesis may be significantly influenced by such possible predisposing factors as avitaminoses,[1, 2] gonadal hormone dysfunction,[3] syphilis,[4] etc. However, no clearly defined line of demarcation exists between such so-called predisposing factors and those that might be of a more exciting nature such as tobacco and trauma.

With respect to the role of leukoplakia in oral cancer, the historical ledger of clinical experience has led to the rather common designation of the lesion as "precancerous". In this regard, it is of some additional interest to note that the many factors generally considered to be predisposing to leukoplakia are the same as those implicated in oral cancer. Similarly, the topographic, age, and sex incidence of leukoplakic lesions somewhat parallels that of mouth cancer.

Although interest in the role of tobacco as a tissue irritant has been manifested for many years, recent months have witnessed a particular concern, owing largely to the publicity that has been given to a possible relationship of lung cancer to cigarette smoking. However, as in the case of bronchiogenic carcinoma, most reports on the general subject of tissue response to tobacco have been based on statistical evidence,[5, 6] and relatively few have attempted a well-controlled clinical or experimental evaluation. Experimental studies have used tobacco in various forms, on various animal species, on various tissue sites, and in various durations of application. The consequent variability of findings is, therefore, not surprising. It is of further interest to note that with all the attention given to the subject of tobacco, only occasional consideration has been given to its possible effect on the oral cavity. Similarly neglected has been a consideration of various systemic and local environmental factors that might influence oral tissue susceptibility to tobacco irritants.

Prior to a preliminary report in 1952 on the effect of tobacco on cutaneous and mucosal tissues of mice,[7] Roffo in 1930 described a rapid onset (25 days) of leukokeratotic lesions on the gingivae of rabbits subjected to daily whole smoke applications.[8] In contrast to these changes, our own previous study of mice indicated a marked resistance of lip tissue to tobacco irritants, whereas similarly treated ears of the same animals showed appreciable change characterized principally by epithelial hyperplasia, fibrosis and chronic inflammation (Figures 1 and 2). The method of whole smoke application has been described previously.[7] These studies on 78 male and female rats of Swiss and C57 strains, also included an evaluation of the effect of gonadectomy and Vitamin A and B complex deficiencies on tissue response to the tobacco irritant. Followed for periods ranging up to 76 days of tri-weekly applications of whole tobacco smoke, it was noted that the degree of cutaneous tissue (ear) response was increased in severity when deficiencies of Vitamins A and B complex were introduced, but decreased in severity when the animals were gonadectomized and then rendered deficient in either of these vitamins (Figures 3 and 4). In no instances, regardless of experimental grouping, did the lips show such effects.

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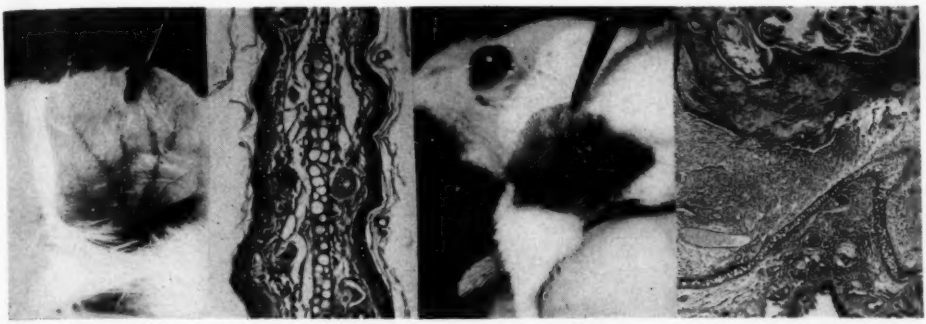

Fig. 1A Fig. 1B Fig. 2A Fig. 2B

Fig. 1A. Ear of control mouse.

B. Microscopic structure of control ear showing uniformly thin epidermis, underlying corium, and centrally positioned cartilaginous plate.

Fig. 2A. Ear of experimental mouse maintained on a normal, adequate diet and receiving alternate daily applications of whole tobacco smoke for a period of 84 days. Note thickening.

B. Histologic section of same ear showing epithelial hyperplasia, keratosis, and chronic inflammation of the corium.

Later studies, reported in 1955, were carried out in order to determine which of the components of the vitamin B complex are of most significance in influencing tissue susceptibility to tobacco.[9] From observation on 201 Swiss strain mice over a period of 80 days, it was found that riboflavin, pyridoxine and pantothenic acid are the B complex components primarily responsible for alterations in tissue response to tobacco (Figure 5). On the other hand, animals maintained on diets deficient in biotin, thiamine and nicotinic acid show no greater tissue susceptibility to alternate day tobacco smoke applications than do mice on a normal adequate diet.

Recognizing, as emphasized by Wynder, Graham and Croninger,[10] that longer range experiments should be pursued in order to validate any findings of tissue response to tobacco applications, another group of 75 Swiss and CAF_1 strain mice, 8 weeks of age at the beginning of the exposure period, were grouped in accordance with sex, nature of diet (normal and B deficient), and whether gonadectomized or not.[11] Applications of whole tobacco smoke were then made at daily intervals. After observation for a period of 19 months, which is more than one-half the average life span of mice, the lips at no time showed evidence of pathologic change. On the other hand, rather striking findings were manifested in the ears of the same animals (Figure 6). In the case of vitamin B complex deficient CAF_1 mice, treated for periods exceeding 17 months, there was marked epidermal cellular change characterized principally by large, bizarre nuclei, prominent dark staining nucleoli and chromatin material, and loss of basal cell polarity. Frequent nests of such cells were also found in the corium and in proximity to sebaceous glands. The epidermis was both hyperplastic and hyperkeratotic with pronounced dyskeratosis and acanthosis and chronically inflamed granulation tissue. Although similar ear changes were noted in all animals, the severity was somewhat less in those maintained on a normal diet and in those of the Swiss strain. Of additional interest in this longer range study was the observation that gonadectomy caused no significant difference in susceptibility. Possibly, the cumulative effect of daily tobacco applications over an extended period of time was sufficient to counteract any

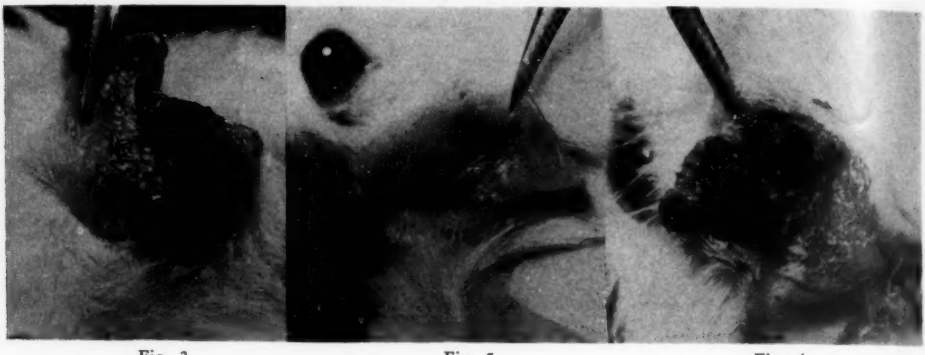

Fig. 3 Fig. 5 Fig. 4

Fig. 3. Ear of mouse maintained on a vitamin B complex deficient diet. There is marked thickening, induration, scarring, and scab formation. Duration of smoke application: 72 days.

Fig. 4. Ear of castrated, male mouse maintained on a vitamin B complex deficient diet. Note the appreciably lessened degree of injury than was present in the non-gonadectomized animal represented in Fig. 3. Duration of smoke applications: 90 days.

Fig. 5. Ear of mouse maintained on a riboflavin deficient diet for 80 days. Note the marked thickening and scab formation. A corresponding picture is found in similarly treated animals maintained on pyridoxine and pantothenic acid deficient diets.

protective influence of castration or ovariectomy as demonstrated in the short-term preliminary studies.

Owing to the small size of the mouse, and the consequent limitation of access to its oral tissues, applications of tobacco were necessarily limited to the muco-cutaneous lip region. Correlative studies were, therefore, carried out on the hamster in order to determine the reaction of intra-oral tissues (palatal mucosa) to whole smoke.[11] Prior to initiating these studies, it was decided that some consideration be given to an evaluation of saliva as a factor in protecting mouth tissues from the irritating effects of tobacco. Based on previous observations in the mouse experiments, it seemed that the washing effect of salivation coupled with tongue activity caused a rather rapid removal of deposited tars form the lips. Consequently, several groups of hamsters were subjected to surgical extirpation of the major salivary glands, in addition to these groups maintained on vitamin B complex deficient diets. A total of 74 hamsters were studied. In addition to the stated groupings, the animals were divided as to sex, strain (golden and albino), and whether gonadectomized or not. Details of experimental groupings were previously described as was the method of smoke application.[11] Following 16 months of daily exposures to whole tobacco smoke, the palatal mucosa continued to show no gross or microscopic evidence of pathologic change regardless of experimental grouping (Figure 7). On the other hand, the ears of the same animals, following similar treatment, showed keratosis and hyperplasia (Figure 8). In light of the failure to produce oral tissue lesions and the observation that, despite extirpation of the major salivary glands, an appreciable degree of oral lubrication continued to exist, correlative smoke applications were made to the pouch mucosa of 40 additional golden hamsters. The advantages of this procedure stemmed from the unique features of the pouch being devoid of glandular elements, as well as quite distant from the environmental influence of salivation and tongue activity. Although observed for only 8 months, the pouch mucosa showed slight to moderate edema and injection.

Based on the foregoing report, several impressions may be recorded.

1. The oral tissues of mice (muco-cutaneous

Fig. 6A Fig. 6B

Fig. 6A. Lesion noted on ear of animal maintained on a vitamin B complex deficient diet. Applications of whole tobacco smoke were made daily for a period of 19 months.

B. Characteristic histologic appearance of ears treated for prolonged periods. There is chronic ulceration, epithelial hyperplasia, and chronic inflammation and edema of the corium. Note the contrasting appearance of the untreated side of the ear to the left of the cartilaginous plate.

lip region) and hamsters (palatal mucosa) possess an inherent resistance to the irritating effects of whole tobacco smoke, which is not significantly influenced by such factors as sex, strain, vitamin A and B deficiency, major salivary gland extirpation, or duration of tobacco smoke applications approaching two years.

2. The mucosa of the hamster pouch is susceptible to the irritating effects of whole tobacco smoke. However, the period of 8 months' exposure is too short to provide a reliable finding.

3. The cutaneous tissues (ears) of mice and hamsters are appreciably affected by applications of whole tobacco smoke. A deficiency of vitamins A and B renders these tissues more susceptible to the tobacco irritant, whereas gonadectomy seems to confer a certain degree of protection for a limited period of time. The nature of the lesions is essentially ulcerative, hyperplastic and inflammatory with, however, an occasional instance of so-called "precancerous" change.

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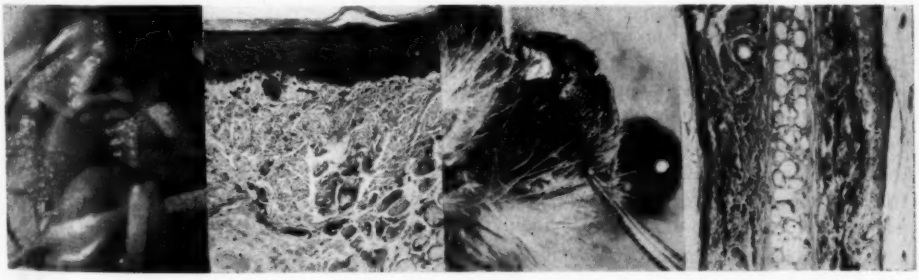

Fig. 7A Fig. 7B Fig. 8A Fig. 8B

Fig. 7A. Normal appearing palate of hamster receiving daily applications of whole tobacco smoke for 16 months.

B. Palatal mucosa of same animal showing normal appearance of epithelium and underlying connective tissue.

Fig. 8A. Ear of hamster following 16 months of daily whole tobacco smoke applications. Slight to moderate thickening is present.

Fig. B. Histologic appearance of same ear showing slight to moderate degree of epithelial hyperplasia.

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LE ROLO ETIOLOGIC DE TABACO, DE AVITAMINOSES, E DE ALTERE FACTORES IN CANCERE ORAL

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SUMMARIO IN INTERLINGUA

Studios clinic de leucoplasia e de cancere del bucca suggere le possibilitate que le pathogenese de iste disordines es influentiate significativemente per factores predispositori del typo de avitaminosis[1, 2], dysfunction de hormon gonadal[3], syphilis[4], etc. Tamen, il non existe un clarmente definite linea de demarcation inter le genere de factores designabile como predispositori e alteres que es possibilemente plus tosto excitatori, como per exemplo tabaco e trauma.

Super le base del reporto hic presentate, plure impressiones pote esser formulate.

1. Le histos oral de muses (region muco-cutanee del labios) e de hamsters (mucosa palatal) possede un inherente resistentia al effectos irritatori de intacte fumo de tabaco. Iste resistentia non depende significativemente de factores como sexo, racia, carentia de vitamina A e B, extirpation del major glandulas salivari, o duration del application de fumo de tabaco (extendite usque a quasi duo annos).

2. Le mucosa palatal del hamster es susceptibile de esser irritate per le effectos de intacte fumo de tabaco, sed le observate periodo de 8 menses de exposition es troppo curte pro supportar un constatation digne de confidentia.

3. Le histos cutanee (aures) de muses e hamsters es afficite appreciabilemente per applicationes de intacte fumo de tabaco. Carentia de vitamina A e B rende iste histos plus susceptibile de esser afficite per le irritante in le tabaco, durante que gonadectomia pare impartir al animales un certe grado de protection, al minus durante un restringite periodo de tempore. Le natura del lesiones es essentialmente ulcerative, hyperplastic, e inflammatori, sed sporadicamente con alterationes del typo designate como "precancerose."

THE INTRADERMAL ASCORBIC ACID TEST: PART III. A STUDY OF FORTY-TWO DENTAL STUDENTS*

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and
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INTRODUCTION

Earlier reports[1,2] have reviewed the available animal and human studies with the intradermal ascorbic acid decolorization test. It is the purpose of this report to describe in detail the results of ascorbic acid studies by way of plasma ascorbic acid and intradermal time determinations in forty-two presumably healthy dental students. As far as we can determine, the only other comparable study is that of Greenberg et al.[9] who evaluated the plasma status of fifty-five medical students.

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An attempt will be made to answer the following questions:

1. What are the plasma ascorbic acid values of a group of young, presumably healthy students?
2. How do these values compare with those reported earlier in the literature?
3. What is the relationship between the plasma ascorbic acid level and citrus juice and fruit intake?
4. Does the plasma ascorbic acid concentration vary with tobacco consumption?
5. What is the range of intradermal decolorization times and the averages of them for a group of young and ostensibly healthy persons?
6. How do these intradermal scores compare with those previously reported in the literature?
7. Is there any association between intradermal decolorization time and citrus intake?
8. Is tobacco consumption related to the intradermal time?
9. What is the relationship, if any, between the plasma ascorbic acid value and the intradermal decolorization time?

METHOD OF INVESTIGATION

The complete study consisted of performing plasma ascorbic acid levels and intradermal times simultaneously in forty-two dental students. The determinations were made regularly at 10:00 A.M. when the students arrived for their clinic duties. The subjects were not informed that these tests would be done. Consequently, there were no preparatory instructions. At this same time, histories of citrus consumption* and tobacco habits were recorded because: (1) the role of citrus intake in the overall ascorbic acid status of the body is self-evident, and (2) there are reports in the literature which suggest that smoking alters the level of ascorbic acid in the body[3,4,5,6].

Laboratory procedures included plasma ascorbic acid levels and intradermal decolorization times. Plasma determinations followed the method of Mindlin and Butler,[7] wherein plasma ascorbic acid level was measured colorimetrically against 2, 6 dichlorophenolindophenol. Intradermal time measurements followed the method of Slobody.[8,56] Because the technique of performing the intradermal test is an integral part of the findings, it is included here:

A 50 cc. volumetric flask with ground glass stopper was autoclaved at 15 pounds pressure for 15 minutes. The flask was removed, stoppered immediately, and then set aside for the moment. Thirty-five cc. of freshly distilled water was heated to boiling in a separate container and allowed to cool to 95° C. A 24 mgm. sample of 2, 6 dichlorobenzenoneindophenol (certified reagent of Fischer Scientific Company #5-286) was weighed out on an analytic balance. This sample was added to the 35 cc. of water which was then allowed to cool. Another beaker, containing enough water to dilute the dye solution to 50 cc., was boiled and also allowed to cool. The solution was then transferred to the 50 cc. volumetric flask with rinsings and adjusted to the 50 cc. mark. This was the intradermal test solution. According to a personal communication from Dr. Slobody, this solution is stable enough to be used for approximately one week. Accordingly, the solution was prepared anew each Monday and used through the following Friday.

The forearm was cleansed with 70 percent alcohol. A 4 mm. area was then marked off with a red pen. With a sterile 2 cc. tuberculin syringe and ½ inch 25 gauge needle. .05 cc. of the dye solution was injected intradermally. This amount of dye introduced between the marked areas on the forearm produced a wheal 4 mm. in diameter. A stopwatch was immediately set. The decolorization of the wheal was checked periodically to determine the time required for complete decolorization of the reagent.

This dye concentration and wheal size were

* Citrus consumption was graded as *good* or *poor*. An individual consuming over three six-ounce glasses of orange juice per week or comparable citrus fruit was regarded as having a *good* intake. Those consuming less than three such glasses per week or its citrus fruit equivalent were classed as *poor* intake.

TABLE 1

Student Number	*Plasma Ascorbic Acid Level (mgm. percent)*	*Intradermal Time (minutes)*	*Cigarettes (per day)*	*Citrus Intake*
1	.07	12	20	poor
2	.10	43	20	poor
3	.19	38	0	poor
4	.22	37	15	poor
5	.25	49	10	poor
6	.25	27	0	poor
7	.25	34	20	poor
8	.28	21	0	good
9	.32	39	0	poor
10	.36	41	20	good
11	.38	27	20	good
12	.38	28	0	poor
13	.38	25	0	good
14	.38	31	0	poor
15	.42	44	20	poor
16	.44	31	0	poor
17	.45	33	0	good
18	.50	45	20	poor
19	.50	42	20	good
20	.50	30	15	good
21	.53	25	20	good
22	.61	18	10	good
23	.63	16	20	good
24	.67	35	15	good
25	.69	25	0	good
26	.74	21	0	poor
27	.74	32	0	good
28	.82	26	0	good
29	.84	13	0	good
30	.87	31	0	good
31	.89	25	0	good
32	.95	21	0	good
33	.99	18	0	good
34	.99	17	5	good
35	.99	21	0	good
36	1.01	18	15	good
37	1.06	15	0	good
38	1.08	16	0	poor
39	1.18	25	5	good
40	1.38	21	0	poor
41	1.44	13	30	good
42	1.48	21	10	good
average	.65	27		
standard deviation	.36	9.7		
standard error	.055	1.49		
coefficient of variation	55	35		

chosen because Dr. Slobody reported, after trial and error, that this dye concentration and wheal size yielded the greatest constancy in any one subject.

It should be mentioned that the same person (F.H.F.) always administered the reagent and always recorded the decolorization time. This was done to reduce the personal error.

RESULTS

Plasma Ascorbic Acid Values: Table 1 lists the plasma ascorbic acid concentrations of the forty-two dental students under the conditions of this experiment. It is clear from this chart that the levels ranged from .07 to 1.48 mgm. percent with a group mean of .56 ± .36 mgm. percent. This means that approximately two-thirds of the subjects varied from .29 to 1.01 mgm. percent. The rather large standard deviation (.35 mgm. percent) indicates the great degree of individual variation. It is of interest that the coefficient of variation was 55. The significance of the coefficient of variation will become clear in a later comparison of the plasma ascorbic acid levels and the intradermal decolorization test times. More pertinent at this point is the fact that there was an almost even distribution of values above and below .60 mgm. percent. From the chart it is evident that 53 percent of the students yielded plasma ascorbic acid values below .60 mgm. percent. The importance of this observation will become clear later in this report. Suffice it to say here that many authorities regard .60 mgm. percent as the dividing line between normal and abnormal

TABLE 2

PLASMA ASCORBIC ACID FINDINGS FROM A SURVEY OF THE LITERATURE

Author(s)	*Plasma Range (mgm.%)*	*Average (mgm. %)*	*Number of Subjects*	*Health*
Greenberg, et al.[9]	.25-1.48	.72	55	medical students
Abt, et al.[10]	.72-1.32	1.24	54	normal
Ingalls[11]	.45-1.32	1.00	9	normal
Pijoan and Klemperer[12]	.65-2.00	?	150	normal
Portnoy and Wilkinson[13, 14]	.60-1.85	1.25	26	normal
Poncher and Stubenrauch[15]	.80-1.80	1.01	35	normal
Baksh, et al.[16]	.30-2.00	1.19	140	normal
Todhunter, et al.[17]	.84-1.46	1.13	35 tests, 5 subjects	normal
Donelson, et al.[18]	?	.66	582	college women
Lubschez[19]	.20-1.60	about .90	63	normal
Roe, et al.[20]	.05-1.60		50	normal
Kruse[21]	0-1.40	?	49	normal
Dallyn and Moshette[22]	.1-2.40	.70 ± .15	447	grade school children
Roderuck, et al.[23]	boys .13-2.18	.78		
	girls .12-2.50	.81	655	school children, 6-18 yrs.
Banerjee and Belarady[24]	?	.88 ± .03	21	normal
Lu, et al.[25]	.07-1.16	.24 ± .137	25	normal females
Bonomolo, et al.[27]	males ?	.75	103	healthy children
	females ?	.78	75	
Cheraskin, et al.	.07-1.48	.65 ± .36	42	dental students

TABLE 3

COMPARISON OF PLASMA LEVEL DISTRIBUTION WITH THE LITERATURE

Author(s)	*Number of Subjects*	*Health Status*	*Percent Below .6 mgm. % Plasma Level*
Slobody[8]	167	hospital patients	35 (below .3 mgm. %)
Eppright, et al.[26]	almost 700	elementary & high school children	over 40
Morris[27]	275	private patients	4
Dallyn and Moshette[25]	447	grade school children	51.7
Greenberg, et al.[9]	55	medical students	45 (below .7 mgm. %)
Pijoan and Klemperer[13]	150	normal	0
Portnoy and Wilkinson[12, 14]	103	normal	36
Poncher and Stubenrauch[15]	41	normal	26
Baksh, et al.[16]	140	normal	14 (below .8 mgm. %)
Todhunter, et al.[17]	5	college women	0
Roe, et al.[20]	50	healthy medical students	32
Roderuck, et al.[23]	655	school children 6-18 yrs.	about 45
Chope and Dray[28]	577	persons over 50 yrs. old	28.8 (below .5 mgm. %)
Cheraskin, et al.	42	dental students	53 19 (below .3 mgm. %)

levels. *If one accepts this demarcation, then over half of the dental students demonstrated inadequate plasma ascorbic acid levels.*

Comparison With Earlier Reports: Table 2 is a summary of the plasma ascorbic acid ranges and means reported from studies of presumably healthy persons as culled from the literature. The chart shows that there is a high intergroup difference—greater than can be explained on the basis that different methods of ascorbic acid determination were used. The lowest reported value was zero[21] while the greatest so-called "normal" value was 2.50 mgm. percent.[23] The range of the dental students in this study was between these reported limits—.07 to 1.48 mgm. percent. It is of interest in this regard that Greenberg et al.,[9] who examined medical students, found plasma ascorbic acid levels similar to those of the dental students in this experiment. They reported a range of values from .25 to 1.48 mgm. percent.

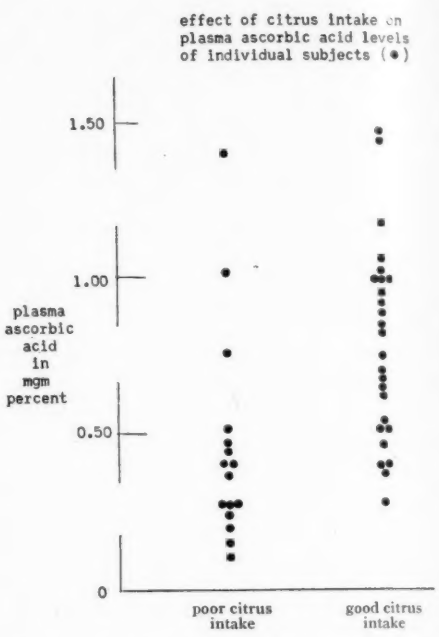
From Table 2 it can be seen that the lowest reported group average is .65 mgm. percent as observed in this study. The next lowest mean is .66 mgm. percent calculated from studies of 582 college women.[18] From these lower means to the high of 1.24 mgm. percent,[10] there is continuous variation of reported values.

It is generally accepted that plasma ascorbic acid levels below .60 mgm. percent represent a poor nutritional status with regard to this particular vitamin. If one accepts this standard of vitamin C health, it is clear that the dental students, as a group, enjoy a very poor state of ascorbic acid nutrition. Table 3 lists the distributions of plasma ascorbic acid values below .60 mgm. percent as reported in the available literature. There is obviously, as shown in Table 3, no unanimity regarding the dispersion of values above and below this so-called standard. The greatest percentage of subjects below this mark is reported in this study of dental students. It is of some interest that only two of the authors[12, 17] found no subjects with values below .60 mgm. percent.

Plasma Level Versus Citrus Intake: Both orange and grapefruit juices contain high concentrations of ascorbic acid. It was felt that a weekly estimate of the consumption of these two foods would be a fair representation of the

customary ascorbic acid intake. Diets containing three or less six-ounce glasses of such juice or an equivalent fruit intake were characterized as *poor*. Students who partook of more than three six ounce glasses of citrus juice, or fruit equivalent, per week were placed in the *good* category. Six ounces of fresh, frozen or canned orange or grapefruit juice contains about 85 mgm. vitamin C. Thus, it was felt that persons imbibing more than three six ounce glasses a week were enjoying a fair intake. Since dietary estimates are not too accurate and since there were not enough patients to judge several degrees of intake, such as good, fair, poor and none, it was felt that a good versus poor distinction would serve best for descriptive purposes. The plasma ascorbic acid values were, then, arrayed into two groups according to this definition. As revealed in Table 4, there is a significant difference between the plasma ascorbic acid levels of the two groups. If the two variables, citrus intake and plasma vitamin C concentration, were unrelated, they would, in 1000 samples, exhibit complete randomness in accord with the concepts of probability. Less than five times in 1000 ($P < .005$) would the present, or greater, relationship be manifest. Thus, the probability is high that the two groups are truly different, since chance variation would only rarely produce this result. This seems to imply that, if nothing else, the plasma determination of ascorbic acid is directly related to the citrus intake. This correspondence is also pictorially represented (Fig. 1 and 2).

Figure 1



Plasma Level Versus Tobacco Consumption: There is abundant evidence that smoking alters

TABLE 4

A COMPARISON OF PLASMA ASCORBIC ACID LEVELS IN SUBJECTS WITH GOOD AND POOR CITRUS INTAKE

Citrus Intake	*Subjects*	*Mean Plasma Ascorbic Acid Value*	*Standard Deviation*	*Coefficient of Variation*
Good	26	.78	.313	40
Poor	16	.44	.343	78

Difference in means	.34
Standard error of difference	.10839
Degrees of freedom	40
Observed t value	3.13682
P	<.005

Figure 2

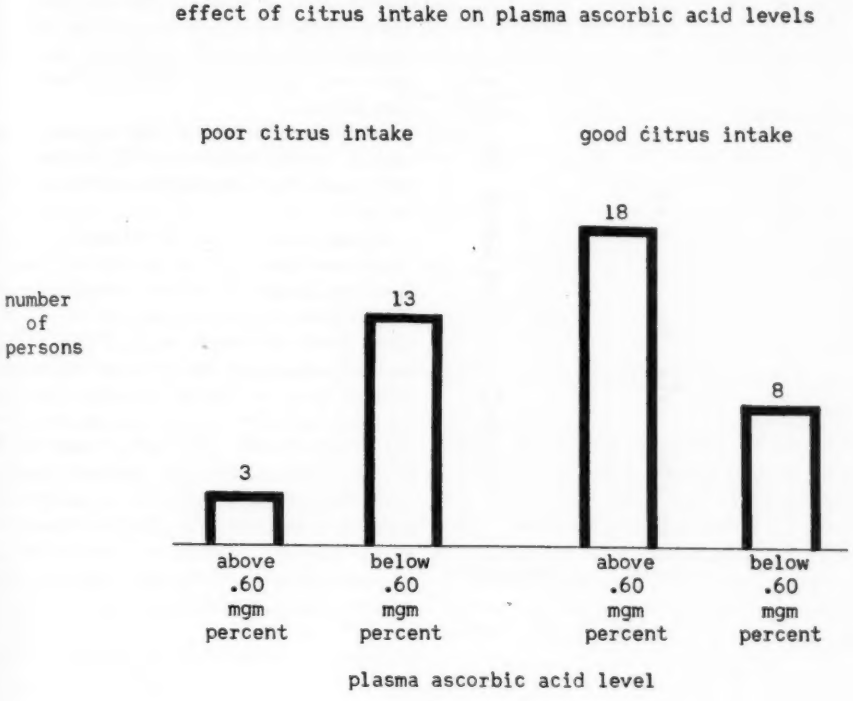
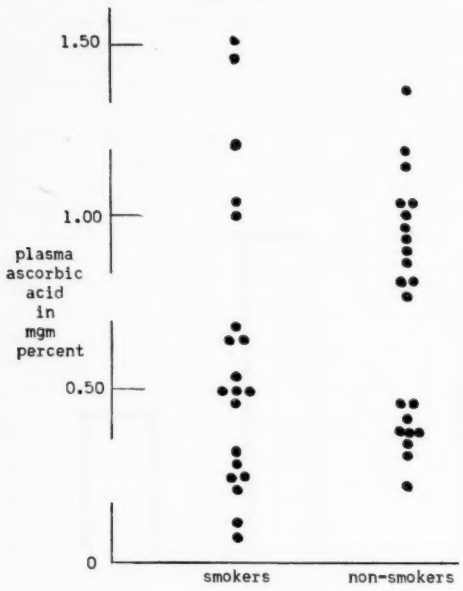


TABLE 5

A COMPARISON OF PLASMA ASCORBIC ACID LEVELS IN SMOKING VERSUS NONSMOKING SUBJECTS

Group	*Subjects*	*Mean Plasma Ascorbic Acid Value*	*Standard Deviation*	*Coefficient of Variation*
Smokers	20	.60	.402	67
Nonsmokers	22	.68	.322	47
		Difference in means	.08	
		Standard error of difference	.11593	
		Degrees of freedom	40	
		Observed t value	.69007	
		P	>.40	

Figure 3



the vitamin C status.[3, 4, 5, 6] Accordingly, the students were divided into two categories on the basis of smoking versus no smoking. All of the smokers used cigarettes. As shown in Table 5, there was no statistical difference between the two groups.

At the same time, the data suggest (Figs. 3 and 4) a mild tendency of the smokers to exhibit diminished concentrations of plasma ascorbic acid.

Plasma Level Versus Combination of Citrus Intake and Smoking: In the final analysis, disease and health are indeed complex concepts. The evidence is growing that disease is not the direct result of a single etiologic factor. Today, multiple causation is being recognized as a more rational basis for disease processes. Since both smoking and diet seem to be associated with the plasma ascorbic acid level, it was felt that persons who smoked and partook poorly of citrus fruits might exhibit, as a group, values different from those of a group of subjects who ingest adequate amounts of citrus fruits and who do not smoke. This was found to be the case as shown in Table 6.

Figure 4

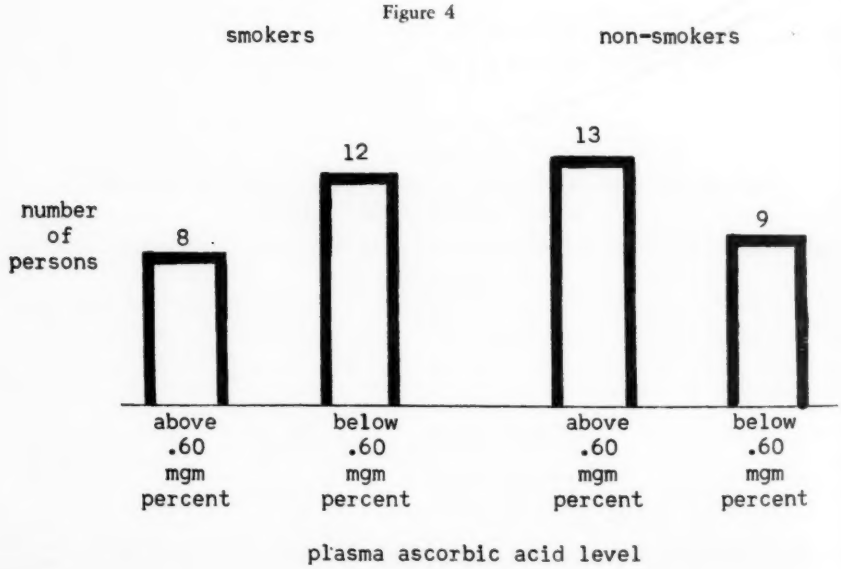


TABLE 6

A COMPARISON OF PLASMA ASCORBIC ACID LEVELS IN SMOKING—POOR INTAKE VERSUS NONSMOKING—GOOD INTAKE SUBJECTS

Group	*Subjects*	*Mean Plasma Ascorbic Acid Value*	*Standard Deviation*	*Coefficient of Variation*
Smokers—poor diet	7	.26	.145	56
Nonsmokers—good diet	13	.77	.239	31
	Difference in means	.51		
	Standard Error of difference	.08584		
	Degrees of freedom	18		
	Observed t value	5.94128		
	P	<.001		

It should be clear from this chart that the plasma scores were three times greater in the nonsmoker-good diet group. These relationships become more pointed when viewed graphically (Figs. 5 and 6).

Multiple factors no doubt complicate the explanation for the disease state. In the study of multiple etiology, large numbers of cases are required. This study demonstrates the interplay of only two variables.

INTRADERMAL ASCORBIC ACID VALUES

Table 1 lists the individual intradermal decolorization scores for the 42 dental students. The values ranged from 12 to 49 minutes. The mean for the group was 27 minutes with a standard deviation of 9.7 minutes. In other words, approximately two-thirds of the subjects demonstrated intradermal values between 17.3 and 36.7 minutes. There was slightly less individual variation here than was apparent with the plasma concentration values. Hence the coefficient of variation for the skin scores (35) is less than for the plasma levels (55). Since the intradermal test has not been widely studied and, more important, less accepted than the plasma determination, there has resulted no intradermal time range by which to gauge health and deficiency with respect to ascorbic acid. Therefore, the mean value of 27 minutes was chosen arbitrarily as a base from which to describe the relative dispersion of scores. The distribution of values on both sides of the mean was about even—52 percent of the subjects revealed disappearance times below 27 minutes.

Comparison with Earlier Reports: Table 7 is an array of the ranges and means of the intradermal times recorded in studies of so-called healthy subjects. There is a surprising degree

Figure 5

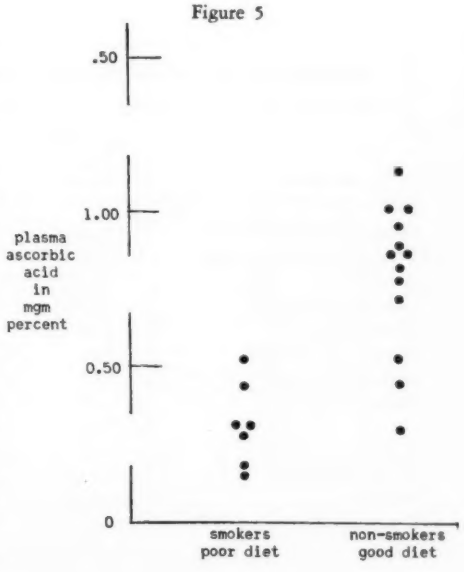
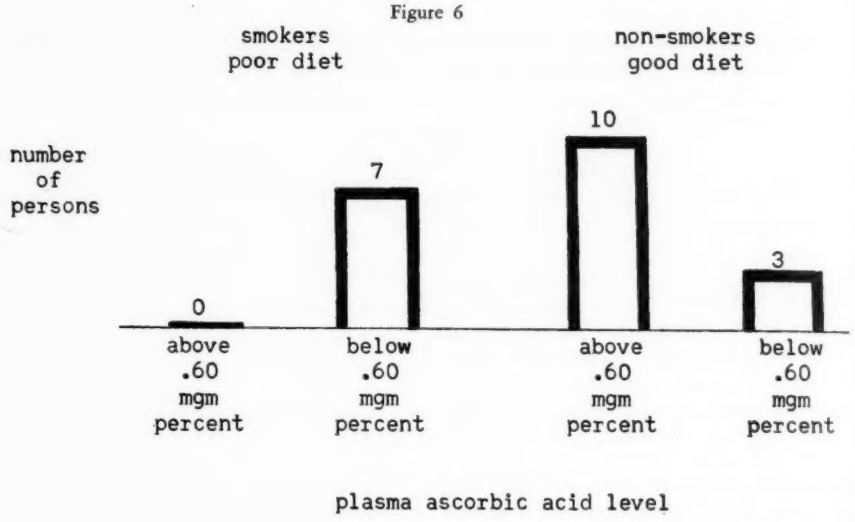


Figure 6



of constancy among the reported ranges. The lowest score was 1 minute and the highest 25.6 minutes. The range of the present study is much greater with limits of 12 and 49 minutes. This may be partly due to the fact that a different dye concentration and wheal size was used. All authors mentioned in Table 7, except Jetter[29], Slobody[8] and the present writers, utilized a N/400 dye solution and a .01 cc. portion for injection. Jetter injected the same amount of dye but employed a slightly more dilute solution (N/500). On the other hand, the writers

TABLE 7

COMPARISON OF INTRADERMAL TIMES AS REPORTED IN THE LITERATURE

Author(s)	*Skin Time Range (min.)*	*Average Skin Time (min.)*	*Number of Subjects*	*Health*
Portnoy and Wilkinson[13]	3-16	8.7	37	normal
Poncher and Stubenrauch[15]	3.5-13.1	7.6	26	normal
Jetter[29]	2-10	6.3	7	normal
Oliveira-Lima[30]	6-11	9.7	12	normal
Goldsmith et al.[31]	2-17.5	6.9	42	normal
Slavich and Torrini[32]	3.5-10	9.6	14	normal
Beck and Krieger [33]	5-16	10.0	62	normal
Bakhsh et al.[16]	1-25	8.2	140	normal
	3-24	9.1	200	?
Reddy and Sastry[34]	3-19	8.1	30	normal
Reddy and Sastry[35]	5.1-14.3	8.1	24	normal
Slobody[8]	3.5-25.6	?	167	hospital patients
Cheraskin, Dunbar, and Flynn	12-49	27.0	42	dental students

TABLE 8

A COMPARISON OF INTRADERMAL TIME IN SUBJECTS WITH GOOD AND POOR CITRUS INTAKE

Citrus Intake	*Subjects*	*Mean Intradermal Time*	*Standard Deviation*	*Coefficient of Variation*
Good	26	24.4	7.53	30.8
Poor	16	32.3	10.54	32.6
		Difference in means	8.2	
		Standard error of difference	3.11134	
		Degrees of freedom	40	
		Observed t value	2.63552	
		P	<.025	

employed a stronger solution (N/300) and injected intradermally an amount five times greater (.05 cc.) than those studies reported in the literature.

The smallest group average was 6.3 minutes[29]. The greatest mean decolorization score was 10 minutes[33]. Again, the greatly divergent average of the dental students may be in part explained on the basis of the different technique of administration.

Much more difficult to reconcile is the contrast of the present results with those of Slobody[8], whose intradermal technique was employed for this study. Although the dental students should be considered healthier than Dr. Slobody's hospital patients, still the students displayed greatly increased intradermal times. The hospital patients revealed decolorization times from 3.5 to 25.6 minutes, while dental students ranged from 12 to 49 minutes. There is no opportunity to compare intradermal score averages. According to plasma levels (Table 3), the hospital patients were worse off as a group than the dental students. Thirty-five percent of the patients yielded plasma ascorbic acid levels below .30 mgm. percent, while only 19 percent of the students exhibited such low values.

Intradermal Time Versus Citrus Intake: It is of interest to discover whether or not the decolorization time is related to ascorbic acid intake. As with the plasma ascorbic acid values earlier discussed in this report, the intradermal times were arrayed on the basis of *good* and *poor* usual citrus consumption. Table 8 shows that the association between diet and intradermal time is not as close as that between the plasma ascorbic acid levels and dietary intake. However, the decolorization score still seems to be an index of dietary intake. Figures 7 and 8 express the tendency for those with high intra-

Figure 7

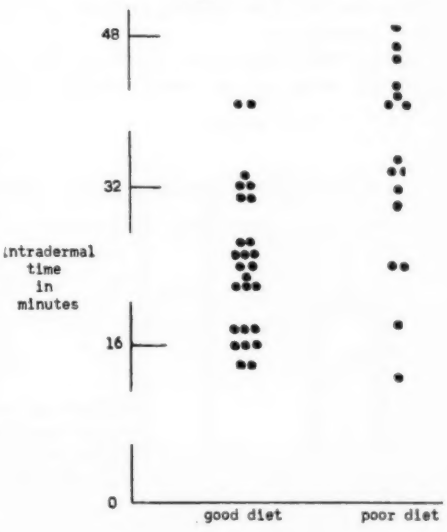


Figure 8

dermal scores to report lesser citrus consumption. This is in accord with the observations of Reddy and Sastry[31] who found lower intradermal times in those subjects with the greatest citrus consumption.

Intradermal Times Versus Smoking: The intradermal scores of the dental students were arranged into two groups on the basis of smoking or nonsmoking. The statistical evidence, as shown in Table 9, was that the two groups were not significantly different. The lack of association is underscored by an examination also of Figures 9 and 10.

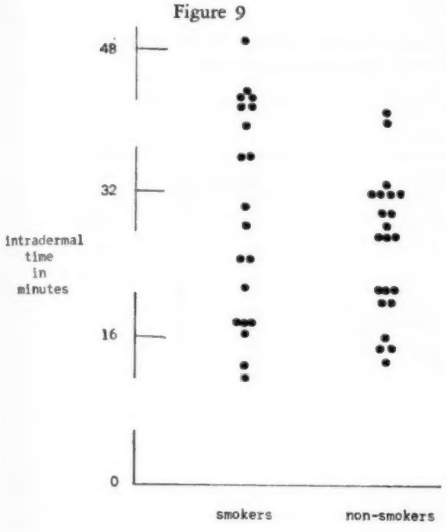
Intradermal Times Versus Combinations of

TABLE 9

A COMPARISON OF INTRADERMAL TIME IN SMOKING AND NONSMOKING SUBJECTS

Group	*Subjects*	*Mean Intradermal Time*	*Standard Deviation*	*Coefficient of Variation*
Smoker	20	29.6	11.6	39
Nonsmoker	22	25.4	6.9	27
		Difference in means	4.2	
		Standard error of difference	3.0674	
		Degrees of freedom	40	
		Observed t value	1.36923	
		P	>.10	

Figure 9



Citrus Intake and Smoking: Again, the effect of selecting groups on the basis of two coexistent variables was ascertained. It should be recalled that the plasma ascorbic acid values of those with good citrus intake and no smoking were found to be three times as high as those encountered in subjects with poor citrus intake and who smoked. Therefore, it was thought advisable to study this same relationship in connection with the intradermal time. The results are depicted in Table 10. It can be seen that there is a statistically significant difference between these two groups of subjects. The intradermal time is much lower in those who possess a good citrus intake and do not smoke. The degree of statistical association is heightened by an examination of Figures 11 and 12.

PLASMA ASCORBIC ACID LEVELS VERSUS INTRADERMAL TIMES

It is of interest to determine whether the plasma ascorbic acid value and the intradermal time are a measure of the same thing. If, for example, the two scores correlated highly, this would suggest that one form of testing is as valid as the other. It would then follow that the intradermal test would be a helpful tool only because it is much simpler and cheaper than the plasma determination. However, if the two variables could be shown to change independently, then it would become a matter of ascertaining which of the two, if either, is a more true measure of the ascorbic acid status of the body.

Survey of the Literature: Many of the authors who studied the intradermal time also evaluated the plasma level. In most such instances, the comparison took the form of a

Figure 10

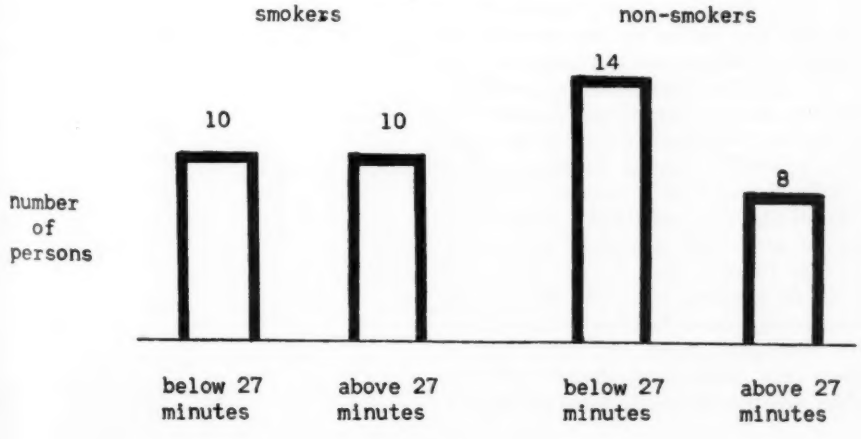


TABLE 10

A COMPARISON OF INTRADERMAL TIME IN SMOKING—POOR INTAKE VERSUS NONSMOKING—GOOD INTAKE SUBJECTS

Group	*Subjects*	*Mean Intradermal Time*	*Standard Deviation*	*Coefficient of Variation*
Smoker—poor diet	7	37.7	11.5	30.5
Nonsmoker—good diet	13	23.5	5.9	25.1
	Difference in means		14.2	
	Standard error of difference		4.64440	
	Degrees of freedom		18	
	Observed t value		3.05744	
	P		<.01	

scattergram. In only isolated instances were statistical devices applied to quantitate the actual degree of relationship, if any.

Portnoy and Wilkinson[13, 14] described a rough tendency of subjects with lower plasma levels to have longer intradermal decolorization times. Poncher and Stubenrauch[15] reported an inclination of groups, selected on the basis of varying plasma concentrations, to exhibit quite bizarre decolorization times. They found a scatter which was the reverse of that reported by Portnoy and Wilkinson. Jetter[29] confirmed the results of Poncher and Stubenrauch. Poulsen and Lieck[36] plotted a scattergram in order to estimate whether any correlation existed. They found none. Wright and MacLenathen[37] indicated that they studied the two variables and discovered a complete lack of relationship. Suzuki[38], on the other hand, described a clearcut parallelism between the plasma ascorbic acid level and the intradermal decolorization score. Goldsmith et al.[31] claimed an absence of a correlation. Bakhsh et al.[16] compared the bivariates statistically. They calculated a coefficient of correlation of —.6522 in students and—.6111 in patients. However, they checked the significance of the coefficient and found that it could have arisen by chance. In other words, the excellent correlation might well have been a sampling error. Slobody[8] admitted that the two variables were not associated. Moena and Nolff[39] expressed a tendency of lower decolorization times to be associated with higher plasma ascorbic acid values.

Present Results: Forty-two combinations of intradermal times and plasma ascorbic acid levels were available for this portion of the study. A scattergram (Fig. 13) allows an easier

Figure 11

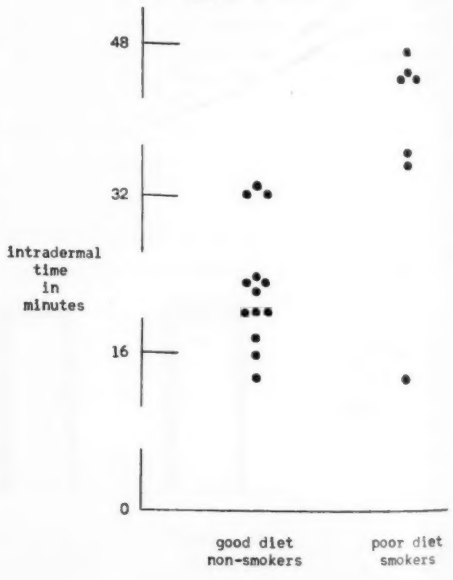


Figure 12

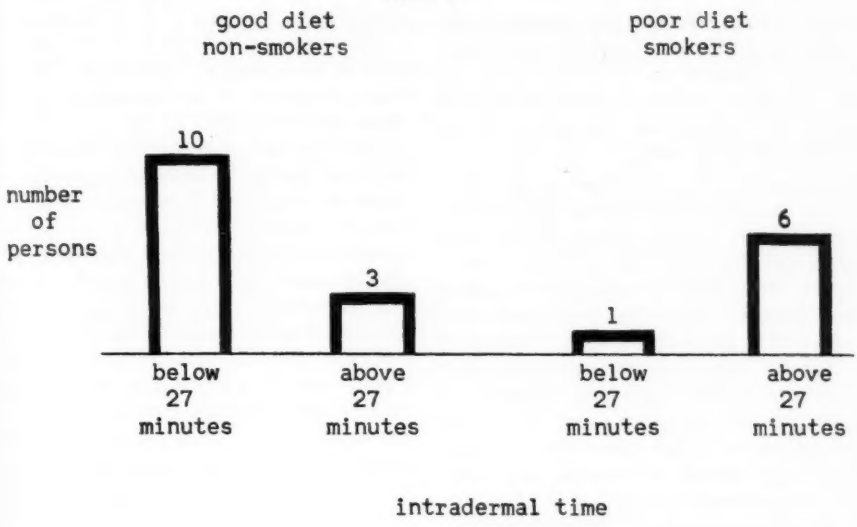
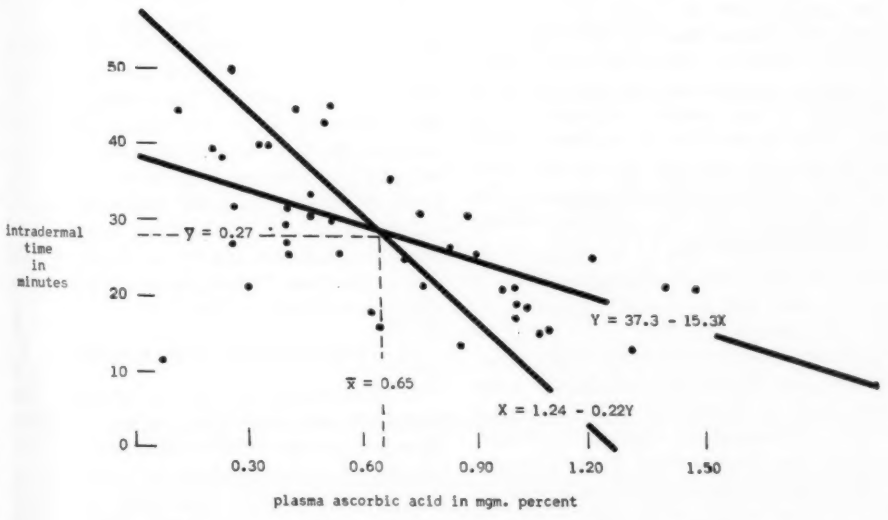


Figure 13

relationship between intradermal time and plasma ascorbic acid concentration



coefficient of correlation (r)	-.58
standard error of r	.15617
observed t	3.71390
probability (P)	< .001

evaluation of the degree of association.

Present Results: Intradermal times and plasma ascorbic acid levels were performed simultaneously in each of the forty-two dental students. Therefore, forty-two paired scores were available for studying the relationship of one determination to the other.

A scattergram (Fig. 13) allows ready visualization of the association between the intradermal time results and the plasma ascorbic acid values. From this graph one may note a tendency for the points to organize themselves linearly from the lower right to the upper left. For descriptive purposes, the graphic pattern is such that the highest plasma levels occur when the intradermal times are lowest. Certainly, if these two scores varied precisely, the points would fall on a straight line. On the other hand, if each measure of ascorbic acid status varied independently of the other, then the position of each score would be determined by unrelated factors, scatter would be extensive and no linear relationship would be discernible. To quantitate the degree of association, one must utilize statistical methods.

The crossed lines in Figure 13 are *lines of regression.* These lines represent the direction of the association which the scores exhibit. Very simply, a regression line is a line about which there is least scatter or variation of the points. Thus, theoretically, if all chance errors could be removed, such that the two tests could be corrected to measure the same quantity, then this line would be the most probable relationship which would follow.

There are two lines of regression shown in Figure 13. One line represents the manner in which the intradermal time (Y) tends to change as the plasma ascorbic acid (X) varies. The other line depicts the way X acts when changes occur in Y. By way of understanding statistical representation through regression lines, limits may be envisaged. If, for example, any two variables were completely unrelated, the regression lines would be at right angles to each other. With a perfect relationship, the lines are superimposed.

This introduces the concept of correlation. A perfect relationship is expressed statistically as a correlation coefficient of ± 1. No relationship is represented by 0. From 0 to ± 1 are all degrees of correlation or relationship. The correlation coefficient of the intradermal time and plasma ascorbic acid (Fig. 13) is —0.58.

The direction of the exhibited relationship has been shown by lines of regression. The degree of covariance is expressed by the coefficient of correlation which is —0.58. The remaining step is to ascertain whether this relationship could have been a chance occurence. This is inferred from the calculation of the ratio, so-called t value, between the correlation coefficient and its probable autovariation in multiple sampling referred to as the standard error of the correlation coefficient. This turns out to be .15617. This means that, if many samples similar to the present one were taken, the correlation coefficient would vary between —0.43 and —0.73. Dividing the standard error of the correlation coefficient into the correlation coefficient yields 3.71390, the t value. An examination of a so-called t table shows a probability of less than .001. This is interpreted to mean that if the two variable are unrelated, a relationship such as disclosed here would occur, through chance, less than once in 1,000 samples. Thus, although the degree of association is not large, the relationship is nonetheless real. The two tests seem to be determined, in part at least, by the same underlying factor, but they are also controlled separately by unrelated functions. In other words, the two tests (plasma ascorbic acid and intradermal decolorization time) vary together, but not so closely as to be able to substitute for one another. The relationship is emphasized in Figure 13.

DISCUSSION AND CONCLUSIONS

It is becoming increasingly apparent that, though we are developing indices of disease, there is a paucity of information for the establishment of criteria of health. It is certainly true that, for some disease states such as diabetes mellitus, there exist fairly close limits, so that health and disease are relatively easy to delimit. But even here, there still remains the problem of uncovering methods for delineating

TABLE 11

"NORMAL" PLASMA ASCORBIC ACID LEVELS

Author(s)	*Accepted Normal (mgm. %)*	*Basis*
Abt et al.[10]	.75 - .80 (.5 prescorbutic)	This level associated with "good" intake of ascorbic acid.
Greenberg et al.[9]	.90 or above	Mean level of persons on a "good" intake.
Wright[40]	.70 - 1.30	Average of persons on a "good" diet.
Portnoy and Wilkinson[25, 34]	.60 - 1.85	Fasting levels of those on a "good" diet.
Poncher and Stubenrauch[35]	.72 - 1.30	?
Ingalls[33]	.70 - 2.00	Generally accepted.
Ralli et al.[41]	1.00	Level observed in patients on 100 mgm. daily supplement.
Morris[27]	.80 - 2.00	?
Goldsmith et al.[31]	.70 - 1.29	?
Butler et al.[42]	.80 - 1.40	Authority of other researchers.
Ralli and Sherry[43]	Deficiency not diagnosable by plasma determination. However, must be above .70 mgm. % to be considered normal.	Inference from a review of the literature.
Fincke and Lundquist[44]	.80	Authority of others.
Purinton and Schuck[45]	.80	Authority of others.
Roberts et al[46]	.70	?
Moena and Nolff[30]	.80 or above	Average level of 10 "healthy" persons.
Rosenberg[47]	1.20 normal .80 prescorbutic below .50 scurvy	?
Donelson et al.[28]	.80	Authority of others.
Haines et al.[48]	.70 - 1.00	Corresponds to a 50 percent urinary excretion of 300 mgm. oral load dose.
Bodansky and Bodansky[49]	1.00	Average of "healthy" persons.
Davey et al.[50]	.60 - .80	Generally accepted.
Roderuck et al.[29]	.80	Associated with 75 mgm. daily intake, which was mean consumption of 705 children.

a defect far in advance of its classic expression. Surely, to pursue the example, the diabetic state must have a beginning. It seems reasonable that its onset even precedes the time when a typical diabetic glucose tolerance pattern can be observed.

Much discussion has centered on whether the plasma ascorbic acid concentration is an adequate index of the ascorbic acid status of the subject. While most authorities accept it (Table II), these same experts differ considerably in their estimate of the *normal* or the *optimal* con-

TABLE 12

"NORMAL" INTRADERMAL TIMES

Author(s)	*Normal (min.)*	*Basis*
Rotter[51]	5 - 10	Associated with good intake of ascorbic acid.
Portnoy and Wilkinson[13, 14]	5 - 10	Close relationship of mean group skin times to the ascorbic acid in the diet and to 5 other tests of deficiency.
Slavich and Torrini[32]	5 - 10	The skin, they believe, stores the vitamin. Ill persons display scores above this level.
Beck and Krieger[33]	under 10	Diseases characterized by a vitamin C deficiency showed times greater than 10 minutes.
Uzan and Bronstein[52]	under 10	Skin times under 10 minutes associated with favorable urine saturation test results.
Reddy and Sastry[34]	5 - 10	Seventy-four percent of healthy medical students had times less than 10 minutes.
Dollé[53]	5 - 10	Surgical patients with the greatest blood loss showed the longest times.
Slobody[8]	under 9	Healthy children on a good diet had times below 9 minutes.
Moena and Nolff[30]	under 14	Persons with ascorbic acid deficiency had prolonged times. Those on a good diet revealed times below 14 minutes.
Banerjee[54]	3 (saturation)	This was irreducible, minimal time after prolonged heavy dosage.

centration. The only point which seems to be generally accepted is that the plasma ascorbic acid level is a fair index of *dietary* intake. But even here what represents a *good* intake is not established. The usual method of defining an adequate intake is based upon a peculiar circularity of justification. A *good* plasma level is considered to be *good* because the intake is *good*. It then follows that a *good* intake is present when the plasma level is *good*.

This type of reasoning is further complicated by the fact that an adequate dietary intake, whatever norms one employs, still does not ensure that the tissues can and will receive a satisfactory amount of the ascorbic acid.

In other words, there has evolved no acceptable base from which to judge the tests of ascorbic acid status. Plasma ascorbic acid levels have been particularly troublesome to standardize since there appears to be no upper limit of health akin to that which is available for blood sugar levels, for example. An overdosage with ascorbic acid is not conceivable according to available information. On the other hand, there is no question but that most researchers accept a lower limit of health as .60 mgm. percent. This, as has already been indicated, is a rather arbitrary figure.

The intradermal decolorization test has encountered all of the problems mentioned in connection with the plasma measuremeats (Table 12). In addition, the tissue test has not received much study. Consequently, it has been difficult to decide precisely what it does measure. Plasma levels are, at least, a chemical index of the vitamin in the circulating blood. This has dignified the test to the point that many investigators no longer even question its reliability. As was mentioned in the earlier publication[1], the intradermal test may conceivably be

an index of *tissue* ascorbic acid status. If the *tissue* concept be a valid one, then the decolorization test possesses the potential of being a better index of body need. Obviously, this remains to be settled.

In the light of the material presented in this report, the plasma ascorbic acid values appear to be a bit more highly related to dietary ascorbic acid than the intradermal time. This point per se does not exclude the potential value of the DCPIP index. After all, the intake and tissue needs of a particular substance are two distinct problems. It should be recalled that neither the plasma level nor intradermal time were closely associated with tobacco consumption. However, the decolorization test did show some tendency of being related to smoking. If tobacco consumption truly increases the need for ascorbic acid or in some obscure way interferes with ascorbic acid absorption and/or utilization, then the intradermal test might be a valid measurement.

There is still another aspect unfavorable to the plasma approach. It would appear that a true measure of *tissue* reserve should exhibit reasonable constancy. The plasma levels vary considerably with intake, diseases and customary social stresses. Not only is the coefficient of variation less for the intradermal time (Table 1) but there is some evidence that the intradermal time is more constant from day to day. In the final analysis, the whole concept of laboratory testing is to obtain a test which reveals immediate need. This means that it must express the additive effects of all mitigating factors. In other words, it must measure duration and intensity of the deficiency state. To do this, it must somehow measure ascorbic acid function at the *cellular* level.

In general, tolerance testing yields more critical information than single determinations. The principle of tolerance study flows from the concept that health and disease are more easily delineated when the body is subjected to the controlled introduction of change. Thus it is that, for the detection of diabetes mellitus, to pursue our illustration, the individual's blood sugar is studied after he ingests a known amount of sugar.

It was felt that an ascorbic acid tolerance test might reveal valuable information not elicitable from either a single plasma determination or intradermal score. A subsequent publication[55] will consider the concept of tolerance testing through a study of 17 dental students following the intravenous administration of known amounts of ascorbic acid.

SUMMARY

1. Forty-two presumably healthy dental students yielded a range of plasma ascorbic acid values from .07 to 1.48 mgm. percent. The average concentration for the group was .65 to .36 mgm. percent.

2. These values were generally lower for a group of healthy subjects than heretofore reported in the literature.

3. A crude measure of dietary ascorbic acid intake reveals a close association with plasma ascorbic acid concentration.

4. There was no significant statistical relationship between smoking and plasma ascorbic acid levels.

5. Those students who smoked and partook poorly of citrus fruit or juice exhibited the least favorable plasma levels. Those who did not smoke and also drank well of citrus juices revealed the highest plasma scores.

6. Intradermal decolorization times for the group ranged from 12 to 49 minutes with a mean of 27.9 $\pm$ 9.7 minutes.

7. These intradermal scores diverged sharply from those reported in the literature. A partial explanation is offered.

8. The intradermal time was not significantly associated with citrus intake.

9. The decolorization time was significantly related to tobacco consumption.

10. Two groups were selected on the basis of smoking plus poor citrus diet and non-smoking plus good diet. These two categories were found to be markedly discrete with respect to intradermal times.

11. The plasma ascorbic acid concentration was definitely related to the intradermal score. However, the degree of association was not high.

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LE TEST DE ACIDO ASCORBIC INTRADERMAL: PARTE III. UN STUDIO DE QUARANTA-DUO STUDENTES DE DENTISTERIA

Dr. med. e dent. med. E. Cheraskin, Dr. dent. med. J. B. Dunbar, e F. H. Flynn (B.S., M.T., A.S.C.P.)

SUMMARIO IN INTERLINGUA

1. Quaranta-duo presumitemente normal studentes de dentisteria monstrava un scala de valores pro acido ascorbic del plasma ab 0,07 usque a 1,48 mg per 100 ml. Le concentration medie pro le gruppo esseva 0,65 a 0,36 mg per 100 ml.

2. Iste valores esseva generalmente plus basse que ulles previemente reportate in le litteratura pro un gruppo de subjectos normal.

3. Un crude mesuration del ingestion dietari de acido ascorbic revela un intime association con le concentration de acido ascorbic in le plasma.

4. Esseva constatate nulle statisticamente significative relation inter le habitude del fumar e le nivellos de acido ascorbic in le plasma.

5. Studentes qui esseva fumatores e qui ingereva pauc fructo e succo citric exhibiva le valores le minus favorabile pro acido ascorbic del plasma. Studentes qui esseva non-fumatores e qui ingereva liberemente fructo e succo citric revelava le plus alte nivellos de acido ascorbic in le plasma.

6. Le tempore del discoloration intradermal variava pro le gruppo total inter 12 e 49 minutas. Le valor medie esseva 27,9 $\pm$ 9,7 minutas.

7. Iste valores intradermal deviava acutemente ab le valores reportate in le litteratura. Es presentate un explication partial de iste constatation.

8. Esseva trovate un association significative inter le tempore intradermal e le ingestion de fructo e succo citric.

9. Le tempore de discoloration non esseva relationate significativemente con le consumption de tabaco.

10. Esseva seligite duo gruppos characterisate per (a) fumar e basse consumption de citro e (b) non-fumar e bon dieta. Esseva trovate que iste duo gruppos differeva marcatemente con respecto al tempore intradermal.

11. Le concentration de acido ascorbic in le plasma esseva clarmente relationate con le valores intradermal. Tamen, le grado de iste association non esseva alte.

CLINICAL APPLICATION OF ULTRASONIC VIBRATIONS FOR SUPRAGINGIVAL CALCULUS AND STAIN REMOVAL

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There is an increasing amount of interest being displayed regarding the ultrasonic cutting principle as it applies to dentistry. Many papers have been written regarding the advantages and disadvantages of this principle as it is associated with tooth and cavity preparation. Doran Zinner[1] indicated in 1955 that the ultrasonic principle might be used in the removal of calculus. Since that time there have been a number of papers dealing with this type of work.[2,3,4,5,6,7,]

In order to determine the relative merits of ultrasonic vibrations for the removal of supragingival calculus and stain, it was felt that many factors needed appraisal. It was felt that the more important factors to be determined were the following:

1. Time required as compared to use of hand instruments.
2. Effectiveness of ultrasonic vibrations as compared with hand instruments.
3. Patient acceptance and reaction.
4. Efficiency and ease of operation.
5. Accessory equipment necessary.
7. Operator fatigue.
8. Field of vision.
9. Bleeding.
10. Healing.
11. Pain.
12. Heat.

MATERIALS

A standard ultrasonic generator providing approximately 23-25 kc/sec. was used.† Tips for prophylactic treatment were also supplied by the manufacturer (Fig. 1). Other instruments included mouth mirrors, explorers, periodontal probes, clinical camera, suction apparatus, reshaped tips (Fig. 2), and standard scalers. Eight patients, four males and four females, ranging in age from thirty to seventy-three, were used in this study.

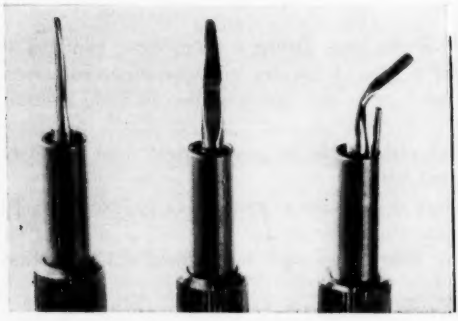

Fig. 1. Ultrasonic tool tips supplied by manufacturer.

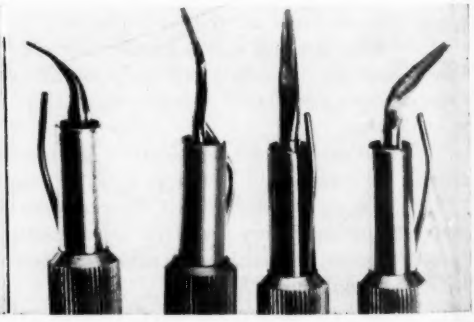

Fig. 2. Ultrasonic tool tips improved with hollow ground surfaces.

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† The ultrasonic unit used and some of the associated tips and materials were supplied by the Cavitron Corporation.

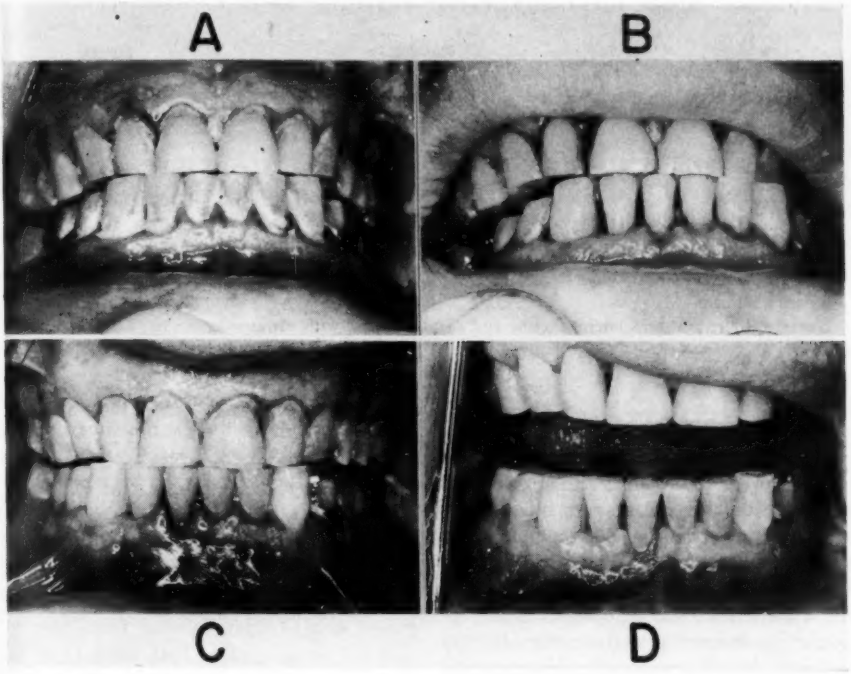

Fig. 3.

A. Before treatment.
B. Immediately after treatment with ultrasonic tool tips.
C. One week later, note tissue damage lower right central incisor.
D. Three weeks later.

METHOD

Two investigators, one acting as the operator and the other as assistant and observer, alternated positions with different patients. Patients were selected with obvious heavy stain and much calculus about the surfaces of the lower six anterior teeth. This area was used because of accessibility. These teeth were photographed (Figs. 3, 4, 5), their mobility tested and recorded, and the surrounding soft tissues were evaluated. A chart was prepared for the purpose and the pertinent points only, are included in this study.

Using the ultrasonic machine, a standard tip deemed serviceable for the area to be treated was tuned to the proper pitch and the water flow regulated to permit satisfactory rinsing. A fluid evacuator (suction pump) was used to remove excess fluid. Warm water was supplied by the ultrasonic unit. The tips were moved over the surfaces of the teeth with very light pressure. No attempt was made to push or pull the debris from the teeth. Only the vibrations were afforded the opportunity of debriding the surfaces with the aid of the water supply. At no time were the tips permitted to remain in any one area for more than four or five seconds. Approximately six full up and down strokes were applied to an area on the crown of a tooth. These rhythmic movements were repeated over the entire crown surface, in sequence, and with overlapping series of strokes until the tooth surface appeared clean. An ex-

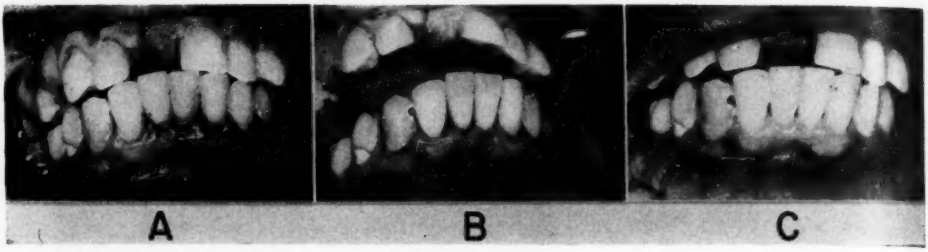

Fig. 4.

A. Before treatment.
B. Lower right central and lateral incisor and cuspid treated with ultrasonic tool tip, same teeth on left side scaled with hand instruments. Immediately after treatment.
C. One week later.

plorer was then used to check on the clinical observations. All responses of the patient and the operator were recorded, the time consumed was checked, and the charts were filled out at the time of the operation. Photographs were taken immediately after treatment and at later dates. As soon as work was completed on a patient, a conference was held between the operator and the observer to evaluate the adequacy of treatment, the efficiency of the apparatus, and to check the findings. The results were recorded in Table 1.

Two of the patients were treated by different operators using routine scaling instruments on three lower anterior teeth while the adjacent three lower anterior teeth of these patients were treated by experienced operators using the tips with the ultrasonic vibrations. The patients were treated by both methods at the same sitting. The results are shown in Table 2.

After several sessions using the ultrasonic tips supplied by the manufacturer, it was found that the results were not what we had expected. A change in the tips was indicated and one of us (S.J.E.) reshaped them. The resulting instruments were slender, tapered from base to tip and hollow ground on both sides (Fig. 2). In cross section the tip presented a dumbell shape. The tip was adjusted to vibrate so that the water burst at the working end and in a wide circumference. These changes in the tips appeared to make debridment easier and perhaps more effective. The reshaping allowed more coolant to reach the vibrating tip and to diminish the heat sensation to the tissues.

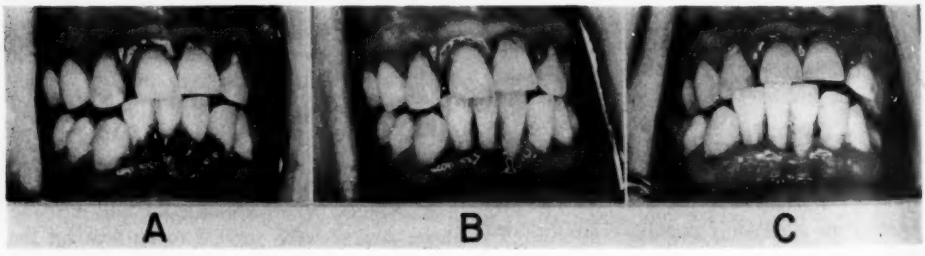

Fig. 5.

A. Before treatment.
B. Immediately after treatment with ultrasonic tool tips.
C. One week later.

TABLE 1. REACTION TO USE OF ULTRASONIC TIPS

Patient			Time Required With Ultrasonic Tips	Patient Reaction	Bleeding Time	Heat Felt by Patient	Pain	
	Sex	Age					During	After
1.	M	51	13 minutes	+	++	+	+	+++*
2.	F	47	14 minutes	+	++	+	+	—
3.	M	73	30 minutes	+	++	—	—	+++#
4.	M	39	10 minutes	+	++	+	—	—
5.	F	70	15 minutes	—	+	—	—	—
6.	M	30	15 minutes	+	+	+	+	++

In any evaluation of a clinical procedure it is necessary to take into account the skill of the operator and his experience in observation, evaluation and notation of results. It is therefore important to understand that a technique effective in one hand may not be as efficient when used by someone else. It is also apparent that observations, evaluations and notations may be subject to a great deal of variation. For these reasons many clinical findings are subject to variable margins of error. We have tried to reduce these errors to a minimum by our conferences before our notations were made.

It is worthy of note that the type of bleeding that was found resulting from the use of the ultrasonic device was different from that obtained with the hand instruments. There was more of an ooze than an actual bleeding which persisted for a longer than normal bleeding time. This phase of the work needs further investigation.

Although the number of patients reported at this time is small, many other cases were treated in a similar manner but were not followed up and they were therefore incomplete. Some interesting findings can nevertheless be mentioned. It is worth noting that the time required for prophylaxis of the six lower anterior teeth ranged from ten to thirty minutes. Another interesting finding is that after an apprehensive beginning, the patients were usually comfortable with the use of the ultrasonic device even though there was excessive oozing of blood and in some cases some after pain.

FINDINGS AND OBSERVATIONS

Six patients were treated for heavy deposits of calculus and stain about the six lower anterior teeth with the aid of ultrasonic vibrations transmitted through a tip. Two patients were similiarly treated for three teeth and their adjoining three teeth were scaled with hand instruments for comparison.

The findings for the factors evaluated are as follows:

1. There was no saving in time by using the ultrasonic device.
2. Calculus removal was as good as with hand instruments, stain removal was better with the ultrasonic tip.
3. After an initial apprehensive period, patient reception of the device was good and subsequent treatment with the machine was well received.
4. Great dexterity is necessary to use the ultrasonic tips properly; when this is achieved, operation is simple.
5. A good suction apparatus or similar device is essential; an assistant is almost as essential.
6. Tactile sensitivity with ultrasonic tips is very poor; and the heat developed in the shaft may annoy the operator.
7. As an adjunct to the full routine of an office where the machine is used from time to time, the fatigue will be mini-

TABLE 2. COMPARISON OF REACTIONS WHEN USING HAND INSTRUMENTS AND ULTRASONIC TIPS

Patient			Time Required in minutes		Patient Reaction		Bleeding Time		Heat Felt by Patient	
	Sex	Age	Ult.	Hand	Ult.	Hand	Ult.	Hand	Ult.	Hand
7.	F.	47	7	7	—	+	—	+	+	—
8.	F	45	6	6	+	—	+	—	+	—

	Pain			
	Ultrasonic Instrument		Hand Instrument	
	During	After	During	After
7.	—	—	+	+
8.	—	—	—	—

Reaction	—Unfavorable	+Favorable	+++Much
Bleeding	+Very Little	++Mild	
Heat	+Moderate	—None	—None
Pain	+Some	++Much	

*Three days duration.
#Tissue injury, exposure of alveolar bone.

mal; but if the machine is used constantly there will be more fatigue evident than with the use of hand instruments. No attempt was made to check operator reaction.

8. The field of vision is badly obscured when using the ultrasonic device, mouth mirrors are of no value at this time.
9. Bleeding of a different character (oozing) is more pronounced and lasts longer after using the ultrasonic tip.
10. Healing is normally good when using the machine. In two instances there was tissue damage (slough).
11. There was no more initial discomfort in using the ultrasonic tips than with hand instruments.
12. The patients indicated that there was some heat felt during the operation with the ultrasonic tips. The operators reported heat in the shaft of the ultrasonic instrument.

In this brief comparative study of the use of hand instruments as compared to the ultrasonic tips, it was found that there was no appreciable difference. In the same time used, calculus was not removed better although stain removal was improved with the machine. These findings and other comparisons are listed in Table 2.

DISCUSSION

Ultrasonic vibrations transmitted through appropriate tips will remove calculus and stain from teeth. In our hands there seemed to be no saving of time nor too great an advantage over hand instruments through the use of the ultrasonic device. It is certainly felt that the machine can be used to advantage in selected cases, but it is also felt that this device should not be used without a thorough training period in a responsible college of dentistry, for tissue and tooth damage can result if the ultrasonic tip is not used properly or if the mechanics of the machine are not thoroughly understood.

Further investigation is needed in the development of better ultrasonic tips and more delicate shafts to increase tactile sensitivity and

to reduce the heat generated in the shaft. Study is indicated to find the reasons for the increased bleeding and the nature of the bleeding. Working in the posterior part of the mouth presents other problems not dealt with in this report. Experimental work is now being done by us to determine the possibility of drug dispersion through the hollow tube tips. Attempts are also being made to test the possibility of the sterilization of instruments with the aid of the ultrasonic vibrations. A further report will be made at a later date.

209 East 23rd Street,
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APPLICATION CLINIC DE VIBRATIONES ULTRASONIC IN LE ELIMINATION DE CALCULO SUPRAGINGIVAL E DE MACULAS DENTAL

Dr. chir. dent. Louis R. Burman (Ph.G., B.S., A.M.), Dr. chir dent. Norman E. Alderman, e Dr. chir. dent. Sol J. Ewen (B.S.)

SUMMARIO IN INTERLINGUA

Sex patientes con forte depositos de calculo e maculas circa le sex dentes infero-anterior esseva tractate per medico de vibrationes ultrasonic transmittite via un puncta. Duo patientes recipeva le mesme tractamento in le caso de tres dentes, durante que tres dentes adjacente esseva distartarisate con instrumentos manual pro objectivos de comparation.

Le constatationes—quanto al factores evalutate—esseva le sequente:

1. Le uso del apparatura ultrasonic resultava in nulle economia de tempore.

2. Le elimination de calculo esseva tanto efficace con le apparato ultrasonic como con instrumentos manual; le elimination de maculas esseva plus efficace con le apparato ultrasonic.

3. Post un periodo initial de apprehension, le reception del apparatura per le patiente esseva bon. Le tractamentos subsequente esseva acceptate prestemente.

4. Alte grados de dexteritate es requirite in le manipulation correcte del apparatura ultrasonic. Si isto es complite, le procedura es simple.

5. Un bon pumpa de suction (o su equivalente) es indispensabile. Un assistente es a pena minus indispensabile.

6. Le sensibilitate del tacto in le uso del puncta ultrasonic es multo basse. Le calor disveloppate in le manico pote devenir enoiose pro le manipulator.

7. Si le apparatura es usate de tempore a tempore commo componente adjunctive in le routine dental in general, le resultante fatiga es negligible, sed si le apparatura es usate continuemente, le resultante fatiga es plus evidente que in le uso instrumentos manual. Non esseva tentate observar le reactiones del manipulator.

8. Le campo de vision es severmente obstruite quando le apparature ultrasonic es usate. Speculos buccal es sin valor a iste puncto.

9. Le sanguination exhibi un differente character in le uso del apparatura ultrasonic. Illo es exsudatori, plus pronunciate, e plus prolongate.

10. Le resanation post le uso del apparatura ultrasonic es generalmente bon. Esseva incontrate duo casos de histolesion (sphacelo).

11. Le disconforto initial in le uso del apparatura ultrasonic non esseva pejor que in le uso de instrumentos manual.

12. Le patientes indicava que illes sentive un certe grado de calor durante le operation del apparatura ultrasonic. Le manipulatores reportava calor in le manico del apparatura.

In iste breve studio comparative del uso de instrumentos manual comparate con le apparatura ultrasonic, il esseva constatate que le duo non differe appreciabilemente. In equal tempores, le elimination de calculo per le apparatura ultrasonic non esseva melior. Del altere latere, le elimination de maculas per le apparatura ultrasonic esseva superior. Iste constatationes e altere datos comparative es listate in Tabula 2.

THE ELECTRIC VITALITY TESTER — PRINCIPLES AND CONSTRUCTION*

ALEX DININ, B.S., D.D.S.**

In diagnosing teeth for abnormalities of the pulp the dentist relies on the patient's history, the radiograph and pulp testing. Determination of the vitality of the pulp should be made before restorative procedures are instituted on any tooth.

Since the pulp lies in the pulp cavity, shielded by the hard tissues of the tooth, it is necessary to apply an external stimulus to elicit a response. The stimulus produces a change in the environment of the nerve. The electric current can be controlled as to quantity and quality so that it has an advantage over other means of testing such as heat, cold, etc., in creating this change in environment.

Various studies[1] have shown that the readily available 60 cycle current is adequate for pulp testing. These studies showed that high frequency currents have no advantage in stimulating a nerve and that testers using such currents have arbitrary scales to denote pulp conditions.

In the construction of an electric vitality tester there are two important problems.

1. We want to know that current is passing through the tooth and is reaching the nerve. This is especially true in instances where there is no pulpal response, such as a non-vital pulp.

2. We want an accurate record of the amount of current required to elicit a response. The record should be in terms of a numerical value which represents the condition of the pulp. This implies that in any future repetition of the test, a change in the numerical value would indicate a change in the condition of the pulp.

When a circuit is completed and current is permitted to flow, the same amount of current (amperes) will flow through every resistance. It takes a certain amount of current to stimulate a nerve at its threshold. If the resistance of a given spot on the tooth is great, it will take a greater voltage, or, more push to force that amount of current to the nerve. For this reason,

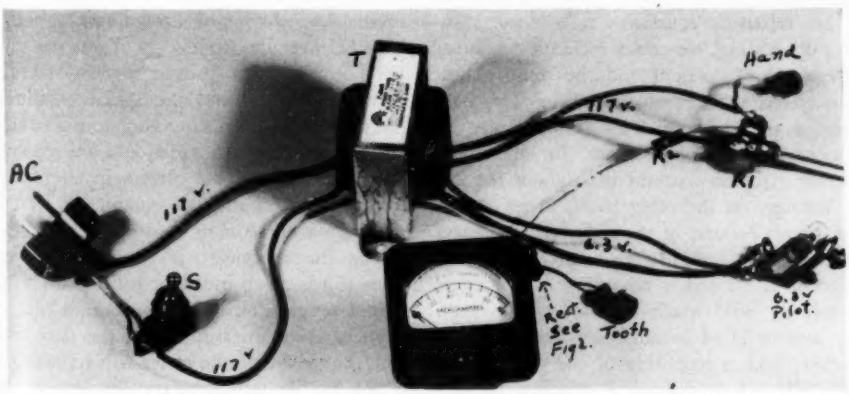


Fig. 1. Layout of component parts.

* From the Department of Endodontia, New York University College of Dentistry.
** Assistant Professor, Department of Endodontia, New York University College of Dentistry.

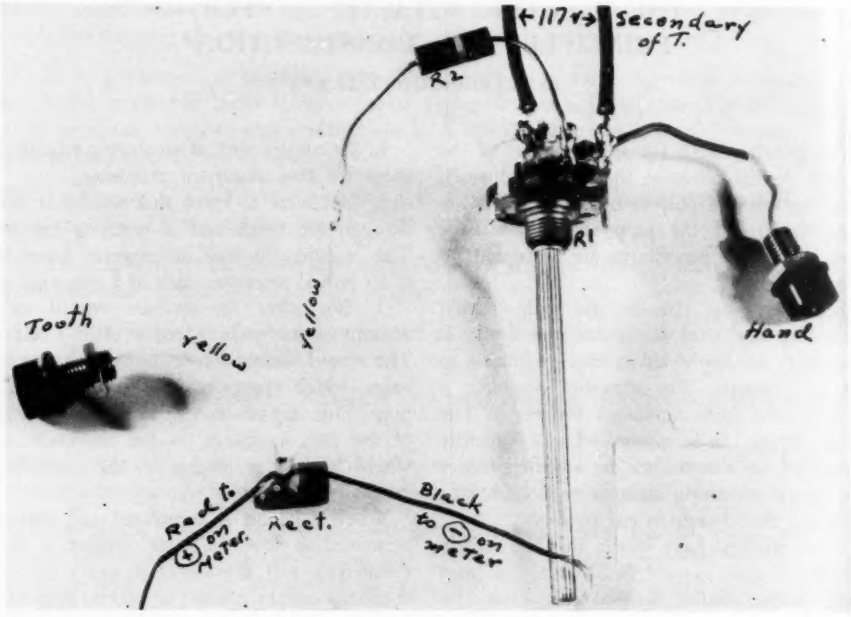


Fig. 2. Detailed layout for connecting meter, instrument rectifier, potentiometer, tooth and hand electrode jacks.

voltage readings vary greatly, while current readings are relatively constant.

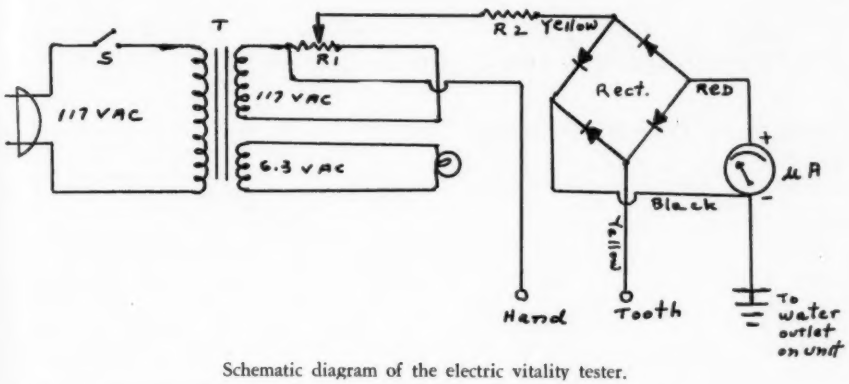
In pulp testing, we create a circuit consisting of the machine, patient and the tooth. These are in effect, a series of resistances. The hard tissues of the tooth, enamel and dentine, are the most important resistances. In any circuit amperage remains constant throughout the circuit. Voltage, on the other hand, varies at different points because of the different resistances present. When, in testing the vitality of a tooth, a response is elicited, a recording of amperage will tell us how much current in the pulp cavity was required to elicit this response. On the other hand, a recording of the voltage will merely tell us how difficult it was for the current to get through the enamel and dentine to stimulate the pulp. It is for this reason that we record vitality responses with an ammeter.

These principles have been incorporated in the construction of an electric vitality tester which has been in use for the past six years in the Department of Endodontia at the New York University College of Dentistry. Its reliability has been proved by the correlation between its tests and the actual condition of the pulp as found during endodontic treatment.

Pulp responses are read on a microammeter. The circuit develops a current in microamperes since it takes a minute amount of current to stimulate a nerve at its threshold.

The microammeter is connected in series. Thus it acts as an indicator to show us whether or not a current is flowing through the tooth. If there is an interruption in the flow of current, the needle on the meter will return to zero. If the needle moves erratically, it usually indicates poor electrical contact between the tooth electrode and the tooth. Wetting the electrode usually remedies this error.

57 West 57 Street,
New York 19, N. Y.



Schematic diagram of the electric vitality tester.

(uA)—Microammeter, 0-100 microamperes DC. (Simpson 127) or similar meter.
(R1)—25,000 Ohm potentiometer, linear taper. (IRC Q11-120).
(R2)—100,000 Ohm resistance, 1 watt.
(Rect.)—Instrument rectifier. (Conant "B").
(S)—Toggle switch, s.p.s.t.
(T)—Transformer, isolation with 6.3 volt tap. (James Millen Mfg. Co. 00011 or Merit p3045).
Pilot light assembly with 6.3 volt bulb.
Two jacks insulated for panel mounting to receive tooth and hand electrodes.
One test prod lead (needlepoint) to hold wood plug for tooth electrode.
One metal rod or tube for hand electrode.
One utility box.

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Medical Views on Oral Problems

EFFECTS OF COOKING ON FOOD

TO THE EDITOR:—*In the field of nutrition, aside from psychological or sensory reactions including geographical and customary dietary habits, what arguments are there, if any, in favor of the cooking of food, aside from possibly the destruction of pathogenic organisms, provided that the natural food is properly reduced in size before mastication?* *C. D. Generales, New York.*

ANSWER.—The destruction of pathogenic organisms seems to this consultant to be an extremely important reason for cooking food, particularly if the source of the food leads one to be skeptical of its cleanliness. Cooking also increases the palatability of many foods and, in the tuberous vegetables, helps to break down the fibrous tissue. Heat increases the digestibility of certain nutrients. Heat will also destroy certain antimetabolites, such as avidin in raw egg white. It would seem to be undesirable to dismiss lightly the psychological and sensory reactions toward food, and, since cooking favorably influences these, there certainly is no contraindication to this method of food preparation. If one should happen to prefer raw foods and is sure of their cleanliness, there likewise would be objection to cooking them, but a middle course is usually best.

* Questions and Answers, J.A.M.A., April 12, 1958, p. 1923.

ACNE AND UNCONTROLLABLE DESIRE FOR SWEETS

TO THE EDITOR:—*What does one do for a 15-year-old boy who has acne vulgaris of face and back and an insatiable and uncontrollable desire to eat sweets? The parents are intelligent, and the son has a good IQ, but no pleading or argument can keep the boy from eating candy before meals, after meals, and at any and all hours. The parents have sought aid from psychologists and internists without success. Is there any known substance which can control the appetite for sweets? Amphetamine combinations have been used in control of appetite for foods in general.* *Horace A. Hall, M.D., Corona del Mar, Calif.*

ANSWER.—Insofar as control of the acne is concerned, the eating of candy is not an impossible situation. If the boy will avoid chocolate, his desire for sweets should not interfere with the cure of his cutaneous condition. Whether x-ray therapy, estrogen administration, or antibiotic therapy is the treatment of choice or what local therapy should be prescribed depends on many factors, such as the severity of the eruption, the tendency toward scarring, the amount of pustulation present, and how much the patient and his parents are concerned about this cosmetic defect. Perhaps of greater importance is the habit pattern being developed by the boy. It is too late now to correct a serious character defect by simple parental discipline. If he cannot develop self-control by himself, the aid of a psychiatrist should be sought. Suppose the boy should develop an overpowering desire for alcohol or any other of the so-called social vices?

* Questions and Answers, J.A.M.A., April 12, 1958, p. 1925.

SERUM CHOLESTEROL MEASUREMENT — HAZARDS IN CLINICAL INTERPRETATION †*

The conclusions that can be drawn from determinations of total serum cholesterol must take into account the varying results obtained by the use of different laboratories, the discrepancies to be expected between samples taken on the same day, and the physiological variations in a given individual over periods of weeks or months. Duplicate serums from three patients who had myocardial infarctions were analyzed in five different laboratories, one of which used two methods. Not only were the results consistently higher in some laboratories than in others, but the rank order of the results varied also. The discrepancies were such as to necessitate great caution in drawing inferences regarding diagnosis and treatment from a single cholesterol determination.

In assessing the patients' progress on therapy, to be of significance a cholesterol level checked but once after therapy must decrease 100 mg/100 cc or else there must be a lesser decrease of about 60 mg per/100 cc which is consistently maintained.

The reproducibility record of a given laboratory and a given method should be evaluated on the basis of replicate measurements made on different days rather than during the same "run".

The physician or dentist who orders a serum cholesterol analysis to assess "Atherogenic potential" should (1) know the performance of the laboratory (2) ask the laboratory to submit its standard deviation of reproducibility along with the report.

† By Arthur U. Reven, M.D., Josephine Yosherro, A.B. Martin Shichman, M.D., Obe A. Schjeide, Ph.D.
* Abstracted from J.A.M.A., April 26, 1958, Vol. 166 #17, by Leonard M. Nevins, D.D.S.

Book Reviews

Oral Surgery, by Kurt H. Thoma, D.M.D., Dr. Med. Dent. H. C. (Zurich), F.D.S., R.C.S. (Eng.), Hon. F.D.S., R.C.S., (Edin.), F.A.C.D., C. V. Mosby Co., St. Louis, 1958, 1607 pages, 1824 illustrations including 129 in color, $27.50.

Many practitioners have considered the earlier editions of this book the "Bible" of oral surgery. Whether in this regard you are a fundamentalist or a non-believer, the possession of this book should be mandatory. No other text covers so comprehensively all those surgical procedures which are in the realm of Dentistry. There is not one specialty of dentistry to which some portion of this book will not be directly applicable. Every general practitioner will be more secure with this text handy for ready reference.

Many of us are prone to ignore the new editions of a work we consider "standard." We succumb instead to the artificial modishness of Detroit's automakers. But the entire medical-dental field is one of rapid change and this dynamism has transfused to oral surgery. If you are the possessor of what should now be a dog-eared first edition, you must get this new version; if you own the second edition, you should get this new one. New chapters have been added on antimicrobials and other drugs, on anesthesiology and on the treatment of abnormalities of the edentulous mouth. The new chapter on roentgen examination of the face and jaws is particularly useful.

The general practitioner will find this text of inestimable value. There are step-by-step drawings of the surgical procedures he is most likely to perform. The accompanying text invariably discusses the pre- and post-operative care, medication and instructions. The more advanced student or practitioner will find this book excellent for review or as a "refresher" when contemplating the treatment of a particular disorder or deformity. The bibliographical references are especially useful as a guide to more extensive review and the foreign literature is always included.

In short, much as there is a Bible in every hotel room, there should be a copy of "Oral Surgery," by Thoma, in every dental office.

STANLEY J. BEHRMAN

Textbook of Medicine, Edited by Russel L. Cecil, M.D., Sc.D., and Robert F. Loeb, M.D., Sc.D., L.L.D., Ninth Edition, 1955, W. B. Saunders Co., Philadelphia, 1786 pages, 201 illustrations, $15.00.

Cecil & Loeb's "Textbook of Medicine" is a veritable bible for both the physician and dentist. This book is completely integrated and one need not look for symptoms in one place, pathology in another and treatment still in a different place. The reader will find it all in logical order under the disease being discussed.

172 American authorities have spent every effort to bring you the important developments in medicine. Each man has written intensively and explictly about that segment of medicine with which he is most familiar. The vast scope of this book covers over 800 individual diseases all the way from etiology through follow-up care.

Cecil & Loeb's textbook will provide most of the information on disease that is needed in a regular medical practice. Etiology, recognition, pathologic physiology, diagnosis, prevention, prognosis and treatment for hundreds of separate diseases are thoroughly discussed.

Although this volume is chiefly used for medical students and physicians, the dental practitioner and specialist would do well to use this book as a reference text.

Clinical Procedures in Occlusal Rehabilitation by S. Charles Brecker, D.D.S., F.A.C.D., 936 illustrations on 428 figures, W. B. Saunders Co., Philadelphia, 1958, $16.00.

Dr. Brecker has presented a comprehensive, well written and profusely illustrated text devoted to oral rehabilitation.

The first portion of the book discusses the step by step preparation of teeth for full coverages. This is followed by a description of the fabrication of fixed and removable partial denture prosthesis. Particular attention is given to the problems of precision attachments and esthetics.

The author has clearly organized the voluminous material involved in rehabilitation procedures. His approach is conservative and his main objectives are patient comfort and esthetics.

The cursory attention given the need for complete periodontal therapy may need reevaluation. Dr. Brecker states,

"The gingiva in general is placed in a satisfactory, healthy condition. It is not the aim of this chapter to classify and present the treatment plan of the various gingival disturbances. Surgical intervention, either by scalpel or by electronic surgery, usually "gets the gingiva in shape" in a comparatively short time so that the operator can proceed with his urgent task of restorative work."

"Clinical Procedures in Occlusal Rehabilitation" will prove valuable in establishing an orderly and systematic manner of treatment. In addition, it will provide a guide for avoiding those cases which are not amenable to therapy and can only result in failure.

A Textbook of Dental Anatomy and Physiology, by Russel C. Wheeler, D.D.S., F.A.C.D. 3rd edition, W. B. Saunders, Philadelphia, Pa., 1958. 413 pages, $8.50.

The title of this book suggests a text only suited for first year dental students. Nothing could be further from the truth. While it is true that a good portion of this book is devoted to important details of tooth anatomy and tooth carving, it is the remaining part which will interest most of the readers. A hint of this is found on the dedication page. The author has written: "Dedicated to those interested in keeping operative and restorative dentistry on its high plane as a science through the furtherance and study of fundamental subjects."

At the present, there is an increasing amount of reconstruction and replacement of teeth. This is due to the fact that the concept of a healthy, well functioning occlusion can maintain the teeth indefinitely. Since the dentist is faced with this situation, he must know the fundamentals of dental anatomy and its effect on the periodontium. The definition of oral rehabilitation implies a return to normal dental anatomy and healthy periodontium. Therefore, everything must be done to help maintain the restored condition.

The progress of dentistry, especially in the past few years in the field of fixed bridge prosthesis has been so rapid, that the dentist no longer need be concerned with speed of preparation, with discomfort to the patient, with accurate impression taking or with accurate model reproduction. However, he must now advance in that part related to accurate reproduction of destroyed anatomy; anatomy that will help maintain the health of the teeth and the periodontium.

I know of no other book from which a dentist, interested in oral rehabilitation, could derive more benefit. This book has always been a favorite, but this new edition, the third, evokes even more enthusiasm. There is so much more than dental anatomy for the freshman student. Several chapter titles point this up. "General considerations of the physiology of the permanent dentition", "Physiologic tooth form protecting the periodontium", "Temporomandibular Articulation", and "The arrangement of the teeth and occlusion".

There is a great deal of evidence that the author has done much to change this edition. He has reorganized much of the material, and has added new photographs and wonderful new line drawings.

One of the first courses in dental college is dental anatomy. Might it not be a good time to review this subject? If so, this *is* the book.

NATHAN WACHTEL

Essentials of Oral and Facial Cancer, by Bernard G. Sarnat, M.D., F.A.C.S. and Isaac Schour, D.D.S., 2nd edition, Year Book Publishers, Chicago, 297 pages, 240 illustrations on 122 Figures, $8.50.

The authors emphasize that cancer is every dentist's responsibility and strongly suggest that every office should be a cancer detection clinic. Drs. Sarnat and Schour have written a thoroughly up to date manual re-arranged and improved in many ways to make it even more useful than the first edition. Emphasis is primarily on guidance and early diagnosis and the steps to be taken if cancer is suspected. Specific attention is paid to the tongue, lips, swelling of the neck, oral manifestations of leukemia, pre-cancerous lesions, secondary cancer, cancer in childhood, the gingiva, and retra-molar area, etc. Differential diagnosis is stressed and laboratory diagnosis including biopsy is dealt with comprehensively. Nine chapters are devoted to treatment and complications of treatment.

Questions are available to test the reader's assimilation of vital facts. An appendix offers quick reference advice on do's and don'ts, danger signs, etc. Innumerable facts will enable the reader to cooperate intelligently with the family physician and the cancer specialist.

This text is recommended reading for every practitioner of dentistry.

1957-58 Yearbook of Dentistry, edited by Stanley D. Tylman, D.D.S., Donald A. Keys, D.D.S., John W. Knutson, D.D.S., Harold J. Noyes, D.D.S., Hamilton B. G. Robinson, D.D.S. and Carl W. Waldron, D.D.S., The Year Book Publishers, Inc., Chicago, 480 pages, 339 iillustrations, $6.50.

The scores of significant world wide advances detailed in the latest "Yearbook of Dentistry" has shed important light on the new diagnostic and therapeutic procedures applicable to the type of cases seen most frequently in every day practice. This year's addition of the "Yearbook of Dentistry" presents once again an excellent cross section of the new advances advocated in the literature during 1957-58.

In less than 500 pages the highlights of all phases of dentistry are thoroughly reviewed. It is interesting to note that more than 110 pages of this book are devoted to endodontics, periodontics and oral medicine. The authors are well aware of the importance of these subjects as related to the field of oral reconstruction.

The 1957-58 Yearbook of Dentistry is a valuable addition to every practitioner's library. In this small book he has an excellent review of all the latest literature summarized and presented in a clear and concise manner.

Academy Proceedings

AMERICAN ACADEMY OF DENTAL MEDICINE ANNOUNCES MID-ANNUAL MEETING

The American Academy of Dental Medicine will hold its Thirteenth Mid-Annual Meeting and Luncheon at the Hotel New Yorker, New York City, on Sunday, December 7th, 1958. There will be a business meeting for members at 10:00 A.M. This will be followed by a luncheon and scientific session for Academy members and friends starting at 12:30 P.M.

The afternoon scientific session will be devoted to "The Gingival Tissue." Participating in this program will be:

1. Henry M. Goldman, D.M.D., Director of the Riesman Dental Clinic, Beth Israel Hospital, Boston; Professor of Periodontology and Chairman of the Department of Periodontology, Graduate School of Medicine, University of Pennsylvania.
2. Maury Massler, D.D.S., Professor and Chairman of the Department of Pedodontics, University of Illinois.
3. Stanley D. Tylman, D.D.S., Professor and Chairman of the Crown and Bridge Department, University of Illinois.

All members and interested dentists and physicians are cordially invited to attend. For reservations and programs address the Chairman, Dr. Nathan Wachtel, 36 Central Park South, New York, N. Y. or Academy Secretary, Dr. George J. Witkin, 501 Madison Avenue, New York, N. Y.

NEW JERSEY SECTION

The New Jersey Section opened the fall season with a scientific meeting on Tuesday, October 15th, 1957. Dr. Alexander Seelig presented a paper on the effect of commonly used medicaments on the pulps of rhesus monkeys.

A combined meeting with the Essex County Dental Society was planned for February and Dr. Albert Schatz was to speak on the proteolysis chelation theory of dental caries. A heavy snow storm made cancellation necessary but we hope to arrange another meeting in the future.

In spite of the failure of our clinician to arrive for our March 11th meeting, it turned out to be a very profitable and informative meeting. Several of our own members gave some case presentations followed by a round-table discussion.

Our last meeting took place on April 23rd, 1958, at the Martland Medical Center where Dr. Martin Protzel presented a full afternoon session on clinical and laboratory diagnostic procedures.

Dr. Frank Schambach and Dr. Ruben Feltman, Co-Chairmen of the 1959 Annual Meeting to be held in Atlantic City, are busy with their plans for what should be an outstanding session.

ABRAM I. CHASENS, *Delegate*

SPANISH LANGUAGE POSTGRADUATE COURSE IN PERIODONTIA AND ORAL MEDICINE

Ten Latin-American dentists have recently completed the fourth annual Spanish language postgraduate course in Periodontia and Oral Medicine at New York University College of Dentistry. The director of this intense four week course which was given during March 1958, was Dr. Sidney Sorrin, Professor and Acting Chairman of the Department of Perodontia and Oral Medicine. He was assisted by more than a half a dozen members of the Periodontia and Oral Medicine Department including Dr. Olga G. de Joly of Argentina.

(Standing, L. to R.) Dr. Guillermo Cruz of Bogota, Colombia; Dr. Moises Seir of Caracas, Venezuela; Dr. Hernan Antonio Coscolla of Buenos Aires, Argentina; Dr. Jaime Arango of Bogota, Colombia; Dr. Olga de Joly; Dr. Antony F. Posteraro (Assistant Professor of Periodontia and Oral Medicine at New York University); Dr. Ricardo Augusto Crespi of Buenos Aires, Argentina; Dr. Mata Amado of Guatemala City, Guatemala; Dr. Francisco Carrasco of Havana, Cuba; and Dr. Marcio B. Condi of Rio de Janeiro, Brazil. (Seated, L. to R.) Dr. Maria Eliana Yanulaque of Santiago, Chile; Dr. Sorrin; Dr. Ana Mercedes Cardozo de Diaz of Caracas, Venezuela; and Dr. George J. Witkin (Assistant Professor of Periodontia and Oral Medicine).

NEW YORK SECTION

The New York Section of the American Academy of Dental Medicine held its spring meeting on April 29, 1958, at the George Washington Hotel, in New York Ctiy.

An exciting speaker, Colonel Joseph Bernier, discussed "An Evaluation of High Speeds—Techniques and Effects". Dr. Bernier, who is Chief of the Armed Forces Institute of Pathology, presented the results of a series of experiments of 14 high speed instruments, including belt, air-turbine and water-turbine driven handpieces. The instruments were rated in these categories: 1) Mechanical efficiency in operation; 2) Effect on patient, eg. noise value, safety in torque; 3) Effect on operator, eg. hazard from noise, fatigue aspect, foot control and 4) miscellaneous characteristics eg. range of operating, ease of cleaning and sterilization. A most fascinating aspect of the lecture was a description of the objective methods devised for the comparative testing of these instruments. A stimulating question and answer period followed.

Officers were elected for 1958-1959. They are:

President—Stephen Nachbar
President-elect—Howard L. Ward
Secretary—Angelo Cacciatore
Treasurer—Seymour Koteen
Editor—Henry Greene
Trustees—Celia Dickman
Fred Romberg
Arthur Nachbar
Delegate—Sanford Kirsch

At the Executive Committee meeting which followed, a planning committee was appointed for the following year, and plans were made for installation of officers in October. The enthusiasm of the committee members toward obtaining an interesting program for the next year, portends a productive administration of our group.

HENRY I. GREENE, *Section Editor*

10 YEAR BIBLIOGRAPHY COVERING THE FIELD OF ORAL MEDICINE AVAILABLE

One of the requirements of the Council on Dental Education for consideration of specialty groups was a preparation of a 10 year bibliography covering the field of Oral Medicine. This bibliography consists of 134 mimeographed pages. Copies of this bibliography ave available to the members of the American Academy of Dental Medicine for $5.00. Interested members should address their inquiries to Dr. Lester W. Burket, 4001 Spruce Street, Philadelphia 4, Pennsylvania.

NEW MEMBERS ELECTED AT TWELFTH ANNUAL MEETING OF AMERICAN ACADEMY OF DENTAL MEDICINE — MAY 29, 1958

Abbey, Carl E.
Holyoke, Mass.

Anderman, Irving
Middletown, N. Y.

Baril, Gilles
Montreal, Canada

Becker, Herbert
Brooklyn, N. Y.

Boyle, Frederick J.
Detroit, Michigan

Cruz, Guillermo C.
Columbia, S.A.

Dufresne, Yves
Quebec, Canada

Dunhaupt, Irwin B.
St. Louis, Missouri

Gilmer, James F.
Harrisburg, Pa.

Green, David
Brooklyn, N. Y.

Grossman, Sidney
Newark, N. J.

Karpinski, Joseph F.
Auburn, N. Y.

Krasner, Daniel
Kew Gardens, N. Y.

Loftus, Edward R.
Quincy, Mass.

Manhold, John H. Jr.
Jersey City, N. J.

Massler, Maury
Chicago, Illinois

McFall, Thomas A.
Washington, D. C.

Miller, Stanley H.
Long Beach, N. Y.

Mintz, Anna
Boston, Mass.

Mishkin, Jack H.
Bronx, N. Y.

Morse, Philip A.
New York, N. Y.

Oliet, Seymour
Philadelphia, Pa.

Pedreira, Rugerpe A.
Rio de Janeiro, Brazil

Quartararo, Ignatius N.
Elmont, N. Y.

Reifman, Jacob
Rio de Janeiro, Brazil

Richardson, Arthur D.
Montreal, Canada

Riff, Wilbur S.
New York, N. Y.

Riskin, Abraham S.
Passaic, N. J.

Sachacter, William
Ossining, N. Y.

Schneider, Paul
New York, N. Y.

Shackelford, John H.
Detroit, Michigan

Stark, Ralph
New York, N. Y.

Wank, Gerald S.
Brooklyn, N. Y.

Weiss, Charles M.
Riverdale, N. Y.

Wilson, John O.
Atlanta, Georgia

Winter, Leo Jr.
New Rochelle, N. Y.

Zelermyer, Max
Watertown, Mass.

Announcements

POSTGRADUATE TRAINING IN PERIODONTIA AND ORAL MEDICINE NEW YORK UNIVERSITY COLLEGE OF DENTISTRY

The following postgraduate courses in Periodontia and Oral Medicine will be offered at the New York University College of Dentistry and will be given by Dr. Sidney Sorrin and associates:

No. 124. REFRESHER COURSE IN PERIODONTIA AND ORAL MEDICINE

Ten sessions, Wednesday, 4:00 to 6:00 P.M. February 11, 1959 to April 22, 1959.
Tutition and books. $156.00. Instruments approximately $55.00.

Theoretical and practical application of periodontal diagnosis and techniques to general dentistry. Four lecture and six clinical demonstration sessions. Equilibration of occulsion is performed by the student on casts. Patient demonstrations include equilibration of occulsion, conservative and radical therapy, home care, etc.

No. 123. PERIODONTIA AND ORAL MEDICINE IN THE SPANISH LANGUAGE

Four weeks, Monday through Friday, 9:00 A.M. to 4:00 P.M.
March 2 to March 27, 1959 inclusive
Tuition including books and instruments approximately $385.00.

Theoretical and practical application of Periodontia and Oral Medicine is fully explained and demonstrated. Equilibration of occlusion is performed by the student on casts. Lectures and clinical demonstrations of diagnosis and treatment planning, conservative and radical techniques, equilibration of occlusion, home care, etc. The entire course is conducted in the Spanish language.

No. 122. COMPREHENSIVE PREPARATION IN PERIODONTIA AND ORAL MEDICINE

No. 122 A. One academic year, full time. September 17, 1958 to May 22, 1959.
Tuition $1,010.00. Instruments and books approximately $135.-00.

No. 122 B. Two academic years, full time. September 17, 1958 to May 27, 1960.
Tuition $2,020.00 (two years). Instruments and books approximately $231.00.

No. 122 C. Two academic years, half time. September 17, 1958 to May 27, 1960. (Two and one half days weekly.)
Tuition $1,010.00 (two years). Instruments and books approximately $135.00.

No. 122 D. Four academic years, half time. September 17, 1958, to May 25, 1962. (Two and one half days weekly.)
Tuition $2,020.00 (four years). Instruments and books approximately $231.00.

These courses are designed for comprehensive preparation in Periodontia and Oral Medicine and are of particular significance for certification towards specialization. All didactic and clinical phases are covered with the objective of developing expert proficiency.

No. 222. GRADUATE COURSE IN PERIODONTIA AND ORAL MEDICINE.

Two academic years, full or half time, beginning Sept. 17, 1958. Tuition $2,020.00. (two years). Instruments and books approximately $275.00.

This program leads to the degree of Master of Science (in Dentistry). The objectives are to teach superior proficiency in Periodontia and Oral Medicine based on adequate background in the basic sciences.

For further information, write to the Secretary, Postgraduate Studies, New York University College of Dentistry, 209 East 23rd Street, New York, N. Y.

AMERICAN ACADEMY OF PERIODONTOLOGY

The American Academy of Periodontology will hold its Annual Meeting at the Baker Hotel, Dallas, Texas, November 6-7-8, 1958.

This meeting is open to all members of the American Dental Association upon the payment of a modest registration fee.

Howard A. Hartman, D.D.S.
Chairman, Publicity Committee
American Academy of Periodontology

GREATER NEW YORK DENTAL MEETING

The Thirty-Fourth Greater New York Dental Meeting, recognized as one of the largest in the world, with outstanding comprehensive coverage of dentistry will be held at the Hotel Statler, New York, N. Y. December 8th through 12th. This Meeting is sponsored by the First and Second District Dental Societies of the State of New York under the direction of Dr. Adolph G. Wagner, General Chairman. Participants from all over the United States, Canada and across the seas will bring the largest in professional techniques, scientific researches and knowledge of diagnosis and treatment.

Registered clinics are conducted by clinicians who are well-known for their capabilities in their respective fields. These clinics will be postgraduate in scope and devoted to a thorough and advanced coverage of specific phases of dentistry. Such postgraduate education has been instrumental in dentistry's progress to an important degree.

The registered, projected, T.V., table and Vu-Well Clinics suplemented by topic discussions, visual education, essays and symposiums will cover every phase of dentistry. Dental manufacturers' displays and scientific exhibits will show not only the most recent aids to our profession, but the paths of dentistry of tomorrow.

Some highlights of the meeting will be: discussions of high speed and ultrasonic techniques; dental health research exhibits from Hospitals, Colleges and the Armed Services; and a T.V. program through the courtesy of the Bureau of Medicine and Surgery of the U. S. Navy.

Further information may be obtained from Mrs. Mabel Purdy, Executive Secretary, Room 106A, Hotel Statler, New York 1, New York.

TEMPLE UNIVERSITY SCHOOL OF DENTISTRY GRADUATE AND POSTGRADUATE PROGRAM — 1958-59

CROWN AND BRIDGE

Fixed Prosthesis Advanced—Dr. Straussberg
January 7-14-21-28, February 2-11-25, March 11-18-25, 1959

The Porcelain Jacket—Dr. Ewing—Dr. Kotanchik
November 6-7-8, 1958

ELECTROSURGERY

Electronic Electrosurgery—Dr. Oringer
March 20-21, 1959.

ENDODONTICS

Clinical Endodontics—Dr. Parris—Dr. Schilder
October 20 to 25, 1958

Immediate Root Resection—Dr. Grossman—Dr. Parris
June 1 to 6, 1959

OCCLUSAL REHABILITATION

Periodontal Prosthesis—Dr. Amsterdam—Dr. Cohen
February 16 to 20, 1959

Gnathology and Oral Rehabilitation—Dr. Udis—Dr. Udis
March 9 to 14, 1959

Transographics in Full Mouth Restoration—Dr. Hoffman—Dr. Hoffman
May 4 to 9, 1959

ORAL MEDICINE

Clinical Oral Pathology—Dr. Jacobs
January 15-16-17, 1959

Oral Medicine for General Practitioner—Dr. Burket—Dr. Rosenthal
March 9-10-11-12-13, 1959

ORTHODONTICS

Graduate Course in Orthodontics—Dr. Hedges and Staff
Two Years—Master Science—Starting in September, 1958.

Advanced Orthodontics—Dr. Strang and Associates
January 18 to 31, 1959

PERIODONTICS

Fundamental Periodontics—Dr. Gottsegan
June 1 to 5, 1959

Advanced Surgical Technics in Periodontal Therapy—Dr. Schluger—Dr. Alloy
April 18-22, 1959

PRACTICE ADMINISTRATION

Practice Administration—Dr. Eshleman
February 28, 1959

PROSTHODONTICS

Full Denture Prosthesis—Dr. Jankelson
April 6 to 11, 1959

Full Denture Prosthesis, Advanced—Dr. Jankelson
April 12 to 18, 1959

RADIODONTICS

Radiodontics Advanced—Dr. Updegrave
January 22-23-24, 1959

THE AMERICAN INSTITUTE OF DENTAL MEDICINE

The 15th Anniversary Meeting of The American Institute of Dental Medicine will be held in Palm Springs, California, October 12-16, 1958.

Dr. E. Cheraskin, Professor of Oral Surgery and Oral Medicine, School of Dentistry, University of Alabama, will speak on selected subjects from the field of Oral Biology.

Dr. S. I. Hayakawa, San Fransisco State College, will discuss "communication" and related subjects in general semantics.

Dr. Joseph C. Muhler, Associate Professor in Biochemistry, Nutrition, and Preventive Dentistry at

Indiana University, will lecture on the relationship of the endocrine system to dental caries, and fluorine metabolism.

Dr. Hans Selye, University of Montreal, will present his world-reknowned concept of "stress", and the "focal syndrome".

Dr. H. M. Worth, from Victoria, British Columbia, will describe the roentgenographic aspects of benign and malignant tumors of the jaws and their differential diagnosis.

Dr. Herbert M. Evans and Dr. K. F. Meyer, authorities in the fields of hormones of the pituitary gland, and virus diseases, respectively, will be featured speakers. The morning sessions will be devoted to presentations of the above subject matters, to be followed in the afternoons by small, informal seminars, optional to the participants. The entire Thursday morning will be utilized in an Open Forum to apply the most important aspects presented to problems in dental practice. Doctor H. Becks will serve as Moderator.

The official program, with full information, may be secured from the Executive Secretary, Miss M. Lewis, 2240 Channing Way, Berkeley 4, California.

UNIVERSITY OF SANTO DOMINGO OFFERS POSTGRADUATE COURSES IN LATIN AMERICA DURING THE SUMMER OF 1958

The University of Santo Domingo College of Dentistry announces three courses to be given in conjunction with the University of Alabama School of Dentistry. These three programs will be held in Ciudad Trujillo, Dominican Republic.

Dr. E. Cheraskin of the University of Alabama School of Dentistry will give a one-week course in "Oral Medicine" from 7 through 11 July 1958.

Dr. William L. McCracken of the University of Alabama School of Dentistry will present a one-week program in "Prosthodontics" from 4 through 8 August 1958.

Dr. Rene A. Puig Bentz of the University of Santo Domingo College of Dentistry will offer a course of one week in "Oral Surgery" from 1 through 5 September 1958.

For further details, contact Dr. Fernando Camino Cestero, Dean, University of Santo Domingo College of Dentistry, Ciudad Trujillo, Dominican Republic.

AMERICAN BOARD OF ORAL PATHOLOGY

The American Board of Oral Pathology will give its annual examination for certification on December 6 and 7, 1958. The place of the examination will be announced when the geographical location of the applicants has been determined.

All applications should be completed and forwarded to the secretary, Donald A. Kerr, D.D.S., University of Michigan School of Dentistry, Ann Arbor, Michigan, before July 1, 1958.

Information relative to certification can be obtained from the secretary.

Donald A. Kerr, D.D.S., M.S.
Secretary, The American Board of Oral Pathology

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY

Workshop in Psychology and Administration for more effective Dental Service — June 23-27, 1958. Daily, 1-4 and 6-9 P.M. Fee: $100.00.

A one week, 30 hour workshop to afford training by lectures, student participation, practice and role playing to show how to interview, examine, educate and motivate patients so they will want the dentist's services and be optimally cooperative.

The subject matter includes psychological understanding of the patient and dentist; specific technics for interviewing and history-taking; education of the patient during the clinical examination; planning for more effective services; and methods for presenting services for the patient's appreciation of their value and to gain his cooperation.

Dr. J. Lewis Blass and Associates

Apply to Postgraduate Secretary, New York University College of Dentistry, 209 East 23rd Street, New York 10, N. Y.

1958 MID-CONTINENT DENTAL CONGRESS
October 12, 13, 14, 15, 1958
Chase-Park Plaza Hotel, St. Louis, Missouri

Sunday, October 12 — Special Course on "Clasp-Retained Partial Dentures" by John F. Johnston, D.D.S., Roland W. Dykema, D.D.S., and Donald M. Cunningham, D.D.S., Indiana University School of Dentistry.

Monday, October 13 — Le Roy Main, D.D.S., St. Louis — "The Roentgen-Ray and Its Contribution to the Language of Pain." George H. Moulton, D.D.S., Atlanta, Ga. "The Crown as a Physiologic and Biologic Entity." Roland D. Fisher, D.D.S., Glendale California. "Dentogenics."

Evening Table and Projection Clinics

Tuesday, October 14 — Eugene W. Skinner, Ph.D. Chicago, Ill. "An Evaluation of the Rubber Impression Materials." William F. Via, Jr., D.D.S., Detroit, Mich. "Special Problems in Dentistry for Children." F. D. Ostrander, D.D.S., M.S., Ann Arbor, Mich. "Current Trends in the Use of Dental

Drugs." W. Harry Archer, D.D.S., Pitssburgh, Pa. "Oral Surgery of Interest to the General Practitioner."

Wednesday, October 15 — Hollis A. Askey, D.D.S., Lincoln, Neb. Practice Management — "These Things Build Success—The Doctor; the Office, the Listening Chair."

All members of the A.D.A. are invited to this rapidly growing regional dental meeting, now located in greatly enlarged and modern convention facilities at the Chase-Park Plaza Hotel.

For further information contact the St. Louis Dental Society, 8013 Maryland Ave., St. Louis 5, Missouri.

TUFTS UNIVERSITY SCHOOL OF DENTAL MEDICINE

Tufts University School of Dental Medicine announces the following Postgraduate Refresher Course.

DPG. 601—A SPECIAL PARTICIPATION COURSE IN PERIODONTOLOGY

Monday through Friday for One Week from October 6 through October 10, 1958
Tuition $150.00 — Class limited to 12
Dr. Irving Glickman and Staff

For further information and application write to: Director of Graduate and Postgraduate Studies, Tufts University School of Dental Medicine, 136 Harrison Avenue, Boston, Massachusetts.

UNIVERSITY OF ALABAMA SCHOOL OF DENTISTRY

During the months of September and October, the University of Alabama School of Dentistry will present the following refresher courses: William T. Heron, A.B., M.A., Ph.D., will present a course in *Hypnosis Applied to Dentistry* on September 20, 21, and 22, 1958; Adeeb E. Thomas, D.M.D. will conduct a course in *Root Canal Therapy* on October 4, 5, and 6, 1958; A. Key Foster, L.L.B., Plato G. Britton, B.S., and Carl P. Heartburg, M.B.A., will combine forces to give a course in *Insurance, Investments and Estate Planning* on October 18 and 19; and Lincoln Roy Manson-Hing, D.M.D. will conduct a course in *X-Ray Techniques for Dental Hygienists and Assistants* on October 24, 25, and 26, 1958.

For further information please write to the Director, Refresher Course Program, University of Alabama School of Dentistry, 1919 Seventh Avenue South, Birmingham, Alabama.

NEW YORK INSTITUTE OF CLINICAL ORAL PATHOLOGY, INC.

The New York Institute of Clinical Oral Pathology announces the Seventh Herman L. Reiss Memorial Lecture to be held at the New York Academy of Medicine Building, 2 East 103rd St., on Monday, October 27, 1958, at 8:30 P.M.

The essayist will be Seymour J. Kreshover, D.D.S.; M.D.; Ph.D.; Associate Director, National Institute of Dental Research, National Institutes of Health, Bethesda, Maryland, who will lecture on the subject of "Prenatal Factors in Oral Pathologic Conditions."

This will be an open meeting to which members of the dental, medical and allied professions are cordially invited.

NEW YORK INSTITUTE OF CLINICAL ORAL PATHOLOGY, INC.

The following course is offered by The New York Institute of Clinical Oral Pathology, Inc.

Clinical Oral Pathology: Two Wednesday evenings a month from October through May, 7:30-10:00 P.M. (sixteen sessions) Class limited to thirty students.

Lectures on Embryology, Hematology, Histology and Pathology (illustrated by lantern slides, blackboard demonstrations, microscopic slides, etc.) and their clinical interpretation.

Case reports stressing History, Clinical findings, X-ray studies, Diagnosis, Treatment (including diagnostic and surgical procedures), Histo-pathological evidence and Prognosis given by the staff of the Institute and Guest Speakers.

The course is approved by the Board of Education of The University of the State of New York.

Inquiries should be addressed to the Executive Secretary, 101 East 79th Street, New York 21 N. Y.

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